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Korea
Appraisal of
A Fifth Railway Project

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CURRENCY EQUIVALENTS

Currency Unit	=	Won
US$1	=	Won 485
Won 100	=	US$0.21
Won 1,000,000	=	US$2,060
Won Billion	=	US$ 2.1 million

WEIGHTS AND MEASURES

1 Meter (m)	=	3.28 feet (ft)
1 Kilometer (km)	=	0.62 mile (mi)
1 Kilogram	=	2.2 pounds (lb)
1 Metric Ton (m ton)	=	2,205 pounds

ABBREVIATIONS AND ACRONYMS

EPB	-	Economic Planning Board
GNP	-	Gross National Product
KAL	-	Korean Air Lines
KNR	-	Korean National Railroad
MOF	-	Ministry of Finance
MOT	-	Ministry of Transportation
OSROK	-	Office of Supply of the Republic of Korea
SMESRS	-	Seoul Metropolitan Electrified Suburban Railway System
TCMC	-	Transport Coordination Minister's Conference
TCWG	-	Transport Coordination Working Group
TPO	-	Transportation Planning Office
UNDP	-	United Nations Development Programme

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KOREA

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SUMMARY AND CONCLUSIONS

i. Korea's rapidly expanding economy, growing at about 10% per annum during the period 1962-1973, has placed a severe demand pressure on the transport system. In that period, freight traffic grew by nearly 12% per annum, passenger traffic by about 13% and international port traffic by 22%. Growing congestion in all modes of Korea's transport system led the Government to a basic reorientation in its investment policy, and transport investment was increased from 17% of the Government's capital expenditure in the First Plan Period (1962-1966) to about 27% in the Second and Third Plan Periods (1967-1971 and 1972-1976).

ii. The Government's transport development strategy, which is based on comprehensive sector studies, emphasizes; (i) the vital role of the railways in the long distance transport of raw materials and other bulk commodities; (ii) the increased importance of highway transport as a complementary mode of traffic for freight and passengers, particularly over short and medium distances; (iii) the need for major port improvement, expansion and organizational reform; and (iv) the need for an effective organizational framework to improve and coordinate transport policy and planning. While the implementation of that transport strategy has contributed a great deal to the emergence of a more balanced transport system, capacity in the transport sector is still insufficient, and congestion of all modes of transport remains a problem.

iii. The evolution of a multimode transport system has ended the virtual monopoly that the railways enjoyed in land transport only a decade ago. However, the Korean National Railroad (KNR) will continue to play a key role as a least cost carrier of bulk traffic and substantial passenger traffic. KNR will also be important in providing a rapid transit system for Seoul and its suburbs since the electrification of the railway system in this area was completed in August 1974.

iv. The management of KNR is generally satisfactory, and operating efficiency is good, but needs improvement. Maintenance of rolling stock and motive power is unsatisfactory, however, due to a lack of funds to acquire spare parts, delays in procurement of plant and machinery for workshops, and rapid increases in traffic demand resulting in the sacrifice of regular maintenance. KNR proposes to acquire both spare parts to rehabilitate existing out-of-service equipment and new rolling stock. Maintenance is expected to return to the normal standards by the end of 1977.

v. KNR's operations have, in the past, been reasonably profitable, with passenger services as the main contributor. This has been due to the

Government's policy of limiting, or denying, freight rate increases on the grounds of curbing inflation, but permitting higher passenger fares than would have been necessary to cover fully distributed costs. In 1971, there was a diversion of railway passenger traffic to improved highways and buses, and with costs affected by rising inflation and devaluation of the Won, KNR suffered a net deficit. Since then a partial recovery has been made, with further deficits in the years 1972-1974. Accelerated borrowing, both externally from supplier's credits and bilateral sources, and internally from Government financed institutions, has imposed on KNR a heavy debt service burden, which, together with the annual net deficits, has resulted in a net working capital deficiency. The proposed investment, coupled with the limitation of further borrowings and relief from debt service obligations, together with the carrying out of various operational and financial improvements including substantial tariff increases, all of which are recommended in this report, should lead to the return of a satisfactory financial situation. This would include adequate working capital, full debt service coverage by 1978, and the earning of a rate of return on depreciated net fixed assets of about 2.1% by 1976, about 3.8% by 1977 and about 5.8% thereafter.

vi. The Project is KNR's Investment Plan during the years 1975-76 except investments carried over from, and financed by, the Third and Fourth Railway Loans. It is designed to help implement Korea's development objectives regarding the railways; to continue the upgrading, modernization and expansion of KNR's track, rolling stock and motive power and other equipment; to improve efficiency and to contribute to the improvement of the railway's financial position. The Project is estimated to cost US$292 million equivalent, of which US$185 million equivalent is in foreign exchange. Included in the Project are an increase in station and line capacity and improvements in signalling (17%); acquisition of diesel and electric locomotives, spare parts and repair facilities (23%); rolling stock (24%); track renewal and improvement and bridge strengthening (12%); completion of electrification of the remaining 71 km of industrial lines (4%); other miscellaneous items (3%); and a contingency allowance of about 17%. The foreign exchange cost of the Project would be financed by a proposed Bank loan of US$100 million, a US Export-Import Bank loan of US$48.4 million, a European Consortium for electrification finance of US$21.3 million, bilateral loans of about US$6.1 million and a West German loan of US$9.3 million. Local costs would be financed from Government resources since KNR's financial situation does not enable it to finance investments from internally generated funds.

vii. The proposed Bank loan would finance spare parts for diesel locomotives, track material and equipment, fabricated bridge girders, 150 passenger coaches, 1,500 freight cars, components for the rehabilitation of heating equipment, wheel sets for passenger and freight cars, plant and machinery for workshops and running sheds, technical assistance for maintenance of motive power and rolling stock, and training of KNR staff. Procurement of loan-financed items would be through international competitive bidding except for US$8.7 million for spare parts for existing diesel locomotives and track

maintenance equipment. Should Korean manufacturers win contracts for manufacturing ordinary passenger cars and freight cars and supplying bridge girders, disbursements from the proposed loan would be made against the ex-factory cost of locally manufactured equipment and materials.

viii. The Project is economically justified. The Government's oil substitution program, of which the investments to increase KNR's coal carrying capacity are an integral part (24% of KNR's planned investments), would yield a first year benefit of over 50%. Other investments covering modernization and capacity extension for KNR (66% of KNR's planned investments) are conservatively estimated to yield an economic return of about 29%.

ix. The Project is suitable for a Bank loan of US$100 million equivalent to the Republic of Korea for a 25 year term, including a five-year grace period.

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

I. INTRODUCTION

1.01 The Government of the Republic of Korea and the Korean National Railroad (KNR) have asked the Bank for a loan of US$100 million equivalent to finance part of the foreign exchange cost of KNR's Investment Plan for 1975-1976. KNR has been called upon to handle rapidly growing traffic and has had to undertake extensive modernization and expansion to fulfill its vital role in the Korean economy. Since 1962, Bank Group assistance to KNR for four railway projects amounted to US$120 million equivalent, about one third of the investment between 1962 and 1974. The first two lending operations have been satisfactorily completed. The third is almost completed, with an outstanding balance of about US$3 million out of a loan/credit of **US$55 million, due to delays in procurement of microwave equipment. The Fourth Loan was made at the end of 1972 for US$40 million equivalent, out of which about US$25 million have been disbursed. Because of large cost increases, some items included in the Fourth Railway** Project were deleted and others reduced in quantity. Priority items which could not be financed under the Fourth Loan, including rails for track renewals and plant and machinery for track and workshops amounting to about US$7.5 million, are being included in the proposed Project. A major item (43 special passenger cars costing US$10.6 million) was deleted due to the very high price quoted by the only bidder, which would not have justified the investment. However, the proposed Project includes the procurement of 150 ordinary passenger cars, which are considered more urgent.

1.02 The proposed loan would be the fifth for KNR: it is designed to continue the upgrading, modernization and expansion of KNR's track, rolling stock and other equipment, and to contribute to the improvement of operations and the railway's financial position, thus ensuring that KNR will continue to play its vital role in the Korean transport system (paras 2.13 and 2.14). KNR's investments for 1975-1976 are estimated at Won 156 billion (US$322 million equivalent), with a foreign exchange component of US$209 million equivalent. The Project to be financed under the proposed loan is KNR's Investment Plan for 1975-1976, excluding those items for which Bank financing is available under the Third and Fourth Railway Projects (Credit 183/ Loan 669-KO and Loan 863-KO). The Project is estimated to cost US$292 million equivalent with a foreign exchange component of US$185 million equivalent.

1.03 Other Bank Group assistance for transportation in Korea has consisted of two highway loans (US$101.5 million equivalent) and one port loan (US$80 million equivalent). The progress of work financed by these loans has been satisfactory. In addition, the Bank contributed to the financing

of a transportation survey in 1965 (US$0.2 million) and of a preinvestment study of highways and transport coordination in 1968 (US$3.5 million), which was refinanced through the First Highway Project. The Bank was also the Executing Agency for a UNDP-financed port study, which resulted in the First Ports Project in 1973. Annex 1 summarizes the Bank group operations in the transport sector.

1.04 This appraisal is based on information supplied by the Government and KNR and on the findings of a Bank mission in June/July 1974 comprising Messrs. Abe (economist), DeLaney (financial analyst) and Tachibana (Engineer). Following the reorganization of the Asia Region, Messrs. Havlicek (economist), Chapman (financial analyst) and Murthy (engineer) participated in the preparation of the appraisal report.

II. BACKGROUND

A. The Transport Sector

(i) Development Strategy

2.01 The development of the transport sector in Korea is seen most clearly when viewed in the context of the very rapid expansion of income, production and international trade. During the period 1962-1973, gross national product (GNP) increased by about 10% per annum, the value of exports by 30% and that of imports by 25% per annum. As a result of this growth, total freight traffic in ton-km increased annually by nearly 12%, passenger traffic in pass-km about 13% and international port traffic about 22%. Growing congestion in all modes of Korea's transport system led the Government to a basic reorientation in its transport investment policy; accordingly allocation of investment for transport was increased from 17% of the Government's capital expenditure in the First Plan period (1962-1966) to 27% in the Second Plan period (1967-71). During the Third Plan period (1972-1976), about 26% (US$1,000 million) of total Government expenditure will be invested in transport infrastructure. While the increased transport investment contributed a great deal to the improvement of transport infrastructure and equipment, capacity in the transportation sector is still insufficient, and congestion in all modes of transport is a problem.

2.02 The Bank's lending strategy in the transport sector is based on the results of a comprehensive survey of land transportation modes completed in 1969, a transport coordination study made in 1970, a UNDP port development study completed in 1972 and the Bank's continued association with, and analysis of, the sector since 1962. In agreement with the Government, it was concluded that: (a) on account of locational factors, the railway could be expected to handle most of the country's long distance freight traffic, of which a large proportion consisted of bulk commodities (coal, ore, oil, fertilizer and cement); (b) the lack of adequate roads needed

urgent attention; (c) major ports required improvement, expansion and organizational reforms, including port management and operations; and (d) an organization for coordinating transport policy and planning was needed to ensure rational investment planning and to develop adequate transport policies.

(ii) Transport Planning and Coordination

2.03 Decision-making in investment planning is still unco-ordinated and dispersed among different Government agencies, none of which plan on the basis of comprehensive information regarding the whole transport sector (Annex 2). The Economic Planning Board, the agency responsible for formulation of an investment policy at the macro-economic level, is not equipped to study individual investment proposals comprehensively. Consequently, there is no mechanism to study transport investment proposals in the context of alternative possibilities in order to achieve the objectives of the Government's stated transport and economic development strategy.

2.04 The Government has made efforts to improve transport coordination and planning as recommended by the consultants who carried out the 1965 land transportation survey. A more detailed study of transport coordination needs was made by consultants retained under the 1968 technical assistance credit (Credit S4-KO). Following extensive discussions among the various Government agencies involved and the Bank, a Transportation Planning Office (TPO) was set up under the jurisdiction of the Ministry of Transportation (MOT) in 1970. Its main functions are to collect data, assist in the assessment of major investment proposals and make technical and economic recommendations in the field of long-term transport planning. TPO is controlled by, and reports to, a Transport Coordination Ministers Conference (TCMC) consisting of the eight cabinet members whose ministries are most concerned with transport matters. TPO's work is supervised by a Transport Coordination Working Group (TCWG), a Civil Service Committee on which the same ministries are represented. TPO has encountered a series of teething troubles, especially in recruiting adequately qualified staff.

2.05 Certain measures designed to increase TPO's effectiveness were discussed during the negotiations for the Second Highway Project in November 1973 and were to have been implemented during the course of 1974. However, little progress was made largely because the Government had not reached firm conclusions about TPO's functions. The Government is currently reviewing TPO's work program for the next three years with a view to taking measures to make it more effective. TPO's future role was discussed further during negotiations for the proposed project in the light of the findings of recent supervision missions and the Government's plans for strengthening it. The Government has agreed, as a condition of effectiveness of the proposed loan, to submit to the Bank its views on TPO's future role and a time-phased plan to take the steps necessary to perform it. Further, the Government undertook to implement the measures to be agreed upon with the Bank to ensure the effective formulation and review of policies and investment proposals related to the transport sector within one year of the submission of the time-phased plan. A transport sector

mission, due in Korea in late 1975, will review these matters and the general question of road/rail transport coordination.

(iii) The Transport System

2.06 The development of the various transport modes in Korea has been influenced by the nature of the terrain (about two-thirds of the land surface is hilly); the concentration of economic activity and population around the Seoul-Inchon and Busan areas; the location of domestic natural resources far from industrial centers, e.g. coal, iron ore and limestone in the north, northeast and center of the country; a long coastline with increasing industrial activity; and the dependence on exports of manufactured goods and imports of bulk raw materials.

2.07 The growth of traffic and of transport infrastructure and equipment in each mode is shown in Tables 1 and 2; KNR has been handling growing quantities of bulk and industrial commodities and passenger traffic; there has also been a large expansion in coastal shipping. KNR accounted for 41%, coastal shipping 35%, and road transport 24% of the total increase in freight traffic during 1962-1973 (30%, 30% and 40% respectively during 1967-1973). As far as passenger traffic is concerned, however, road transport (73% of the total pass-km in 1973) has captured most of the increase. From 1962 to 1973, road passenger traffic increased almost sixfold from 5.5 to 32.1 billion pass-km despite the limitations of the road network; this compares with a twofold increase from 5.9 to 10.7 billion pass-km in railway traffic. The explanation for this increase is the rapid development of urban traffic as a result of a large increase in population in the major cities, as well as the commencement of expressway bus service between Busan and Seoul, which initially made heavy inroads into railway passenger traffic on that line. However, the situation now seems to have stabilized (paras 3.11 and 3.12) and railway passenger traffic has resumed its growth. There was a spectacular growth in port traffic, from 7.5 million tons in 1962 to 57.8 million tons in 1973, due mainly to increases in imports of bulk commodities such as oil, grain and lumber and in coastal cargoes such as fuel, coal and cement. Railway operations and traffic are discussed in detail in Chapter III, and Annex 3 gives details of the development of the Transport Sector for 1962-1973.

Highways

2.08 Only about 15% of the total 40,600 km highway network is paved, and the vehicle density is among the lowest in Southeast Asia, with one vehicle per 200 persons in 1973. Limited paving of the roads is due mainly to the low priority given to developing the road network and the allocation of a large part of the increased highway funds available during the 1968-1971 period to the construction of 640 km of toll expressways, of which 458 km are four-lane divided (Seoul-Busan, 428 km; Seoul-Incheon, 30 km), and 182 km are two-lane (Daejon-Jeonju, Suweon-Weonju). A major policy change occurred in 1971, shifting the emphasis from high standards of road construction to more paving and lower construction standards adjusted to expected traffic levels.

Also, the Government is beginning to recognize the importance of road maintenance. These changes were achieved partially through the First and Second Highway Projects. Currently, road density is generally sufficient, but the condition of most of the road network is still unsatisfactory. A plan of action for the establishment of a highway maintenance field organization, including procurement of equipment, was agreed between Government and the Bank as an integral part of the Second Highway Project. However, implementation of this plan has been delayed due to slow administration and legal procedures.

2.09 The relatively small number of vehicles in the country reflects the import restrictions and the restrictive licensing policy for the road transport industry. While, for balance of payments reasons, the Government is reluctant to liberalize the importation of road vehicles and components for local assembly, it has agreed in the Second Highway Project to eliminate, by June 1975, restrictive licensing policies such as minimum ownership of a certain number of road vehicles for commercial transport and to remove limitations on the use of the National Highway Network by trucks and buses.

Ports and Shipping

2.10 The infrastructure in ports also has capacity limitations. Currently, the most important port is Busan, which is chronically congested. The Government has been constructing various ports recently to serve new industrial complexes, e.g. Incheon, Pohang, Ulsan and Masan. A study of possible port improvements, by Lyon Associates (USA) and Economist Intelligence Unit (UK), financed by UNDP with the Bank as Executing Agency, was completed in late 1972. Its recommendations became the basis for the First Port Project (Loan 917-KO in 1973, US$80 million) covering Busan and Mug Ho.

2.11 Coastal shipping plays an important role in Korean transport (26% of the total freight traffic, in ton-km, in 1973), due mainly to the construction of industrial complexes on coastal locations and the shortage of rail and road capacity. Korea, like other countries, has been aiming at the attainment of greater self-sufficiency in merchant shipping. About 22% of the country's total foreign trade tonnage has been carried by Korean vessels during the past three years. The shipbuilding industry in Korea is rather new, but its production has been increasing rapidly as the result of recent construction and expansion of shipyards at Busan and Ulsan.

Aviation

2.12 Air transport remains comparatively unimportant. The privately operated Korean Air Lines (KAL) provides domestic and international flights. Most international traffic is handled at the Seoul-Kimpo International Airport.

B. The Role of the Railways in the Transport System

2.13 Historically, the railways and coastal shipping have been the major modes of transport in Korea. Road transport, particularly with regard to passenger transport, has only since the last decade established itself as an important means of transportation. As a result of the increased high-

way expansion since 1968, road-rail competition has grown keener, with trucks and buses competing for short distance traffic. Undoubtedly, the virtual monopoly enjoyed by the railway only a decade ago has now ended, and the transport system is evolving into a more balanced multi-modal system where the different traffic modes complement each other according to their technical and economic characteristics. Nevertheless, intermodal cost comparisons show that rail transport is still the most important means of moving bulk traffic economically over medium and long distances. Except for expressway bus services, road and rail passenger traffic generally do not compete with each other.

2.14 The continued preponderance of the railways in long-distance freight and passenger traffic is explained to a large extent by the geographical pattern of economic activity and the topographical characteristics of the country, which make movement by rail the most economic means of transportation for a large proportion of the total movement of commodities and passengers. Domestic natural resources require heavy bulk transport to the industrial areas; thus, about 76% (based on 1973 data) of rail freight traffic consists of bulk commodities. In 1973, anthracite alone accounted for 37% of total rail freight. In addition to its long-distance hauling, KNR will be important in providing a rapid transit system for Seoul and its suburbs since the electrification of the railway system in this area was completed in August 1974.

III. THE KOREAN NATIONAL RAILROAD

A. Organization, Management and Staff

3.01 In 1963, KNR was established as a semi-autonomous agency within the Ministry of Transportation, with its own management, accounts and a special section of the national budget, its accounts being kept separate, as distinct from a Government department. The Government exercises control over KNR in staff, financial and budgetary matters and over the allocation of freight cars for important commodities such as coal, grains and fertilizer.

3.02 The Director General of KNR is appointed by the Minister of Transportation and exercises his power through various bureaus. Chart 6847(R) shows KNR's organization. The KNR management is generally satisfactory; however, a shortage of senior qualified engineering, economic and accounting staff, coupled with the size and complexity of KNR's investment program, has led to the employment of consultants to study several aspects of railway operation, finances and investment needs. Consultants are also being retained by KNR for the electrification of KNR lines in the Seoul suburban area (part of the rapid transit project for the Seoul metropolitan area) and implementation of its commercial accounting system.

3.03 The number of permanent employees with Government civil servant status was about 33,750 at the end of 1973, somewhat less than the peak figure of 36,067 employees in 1971. In addition, KNR employed about 2,700 workshop personnel, 1,000 security personnel and 2,300 others, including some 2,000 seasonal temporary personnel for track works. The traffic units (ton-km and pass-km) per employee during 1973 was 469,000, which is comparable **to Taiwan (462,000) and France (412,000) and considerably higher than that for many other railways (U.K. 248,000; Italy 263,000).**

3.04 Salaries per employee range from about Won 25,000 to about Won 164,000 per month and are in line with Government pay scales; total staff costs in 1973 were only about 42% of operating expenses as against 60%-70% in many other railways. Staff remuneration in KNR is lower than that of industrial and commercial enterprises in Korea, and this has been causing KNR some difficulties in recent years in retaining sufficient qualified personnel. KNR has consequently been strengthening its recruitment program through expansion of its training school and its training curricula. KNR will submit to the Bank as part of a plan of action a training program, for its review, as detailed in Annex 6. In general, the staff displays excellent discipline and productivity.

B. Railway Property

3.05 The present position with regard to railway property and the context in which improvements are now planned is described in Annex 4. Track has generally been well maintained; however, with the growth of traffic, a change in maintenance procedures is necessary on some main lines, and the track must be improved. This is planned, together with replacement and strengthening of bridges. Modernization of signalling is also required and is being undertaken. Marshalling facilities in yards and stations, particularly in the Seoul area, need to be augmented.

3.06 KNR's motive power and rolling stock position at the end of 1973 is given in Table 3. KNR is almost fully dieselized or electrified, but has some steam locomotives which are used for shunting operations. The phasing out of steam locomotives, scheduled for 1974, has been postponed beyond the end of 1976 in order to facilitate the planned improvement of maintenance of diesel locomotives, which has been neglected. About 100 passenger cars and 220 freight cars will be scrapped during 1975-76.

3.07 KNR's facilities for maintenance and repair of motive power and rolling stock need to be improved and reorganized (para 3.15); the problem was previously studied by Touche Ross & Co. (Canada) in 1971, financed under Credit 183/Loan 669. The recommendations of the consultants were accepted by KNR but have not yet been fully implemented due to delays in procurement of parts and workshop machinery machinery (paras. 3.14 and 3.15). Difficulties in acquiring land were encountered with regard to KNR's earlier plans for a freight car workshop at Dae Joen; a substitute is to be built at Hae Dok.

C. Traffic and Operations

(i) Freight Traffic

3.08 KNR's freight traffic statistics from 1964 through 1973 are summarized in Table 4. During this period, freight traffic grew 7.2% per annum in tons and 7.4% per annum in ton-km. Major commodities which contributed to these increases were coal and cement; coal transportation increased from 8.3 million tons in 1964 to 13.6 million tons in 1973 and cement from 1.1 million tons to 7.5 million tons during the same period. In 1973, freight traffic was 37.8 million tons and 8.6 billion ton-km, with an average freight transport distance of 228 km. Freight net ton-km per route-km was 2.74 million in 1973. Traffic density is highest on KNR's industrial lines between the Seoul area and the northeastern parts of Korea, which carry large volumes of coal and cement, followed by those between Seoul and Busan.

3.09 Bulk commodities such as coal, cement, oil, fertilizer, ore and grains constituted 76% of KNR's total freight ton-km in 1973; the remainder, consisting mainly of general goods suitable for highway transport, increased about 0.3 billion ton-km in 1973 from about 1.2 billion ton-km in 1971 and 1972. This completely reversed the trend of 1969-1972, when highway transport development caused this category of freight traffic to decline significantly. Part of the increases can be explained by railway container services between Seoul and Busan which were introduced in September 1972, and the lack of highway transport capacity.

3.10 Table 5 shows KNR's freight traffic forecasts from 1974 through 1979, which take into account the prospective competitive siutation, expected increases in the production and distribution of coal, cement and fertilizer, and increases in railway capacity arising from the implementation of the proposed project. The average traffic growth rate is expected to be 8.7% per annum and to reach 62.6 million tons and 14.2 billion ton-km in 1979, with the basic composition of traffic remaining unchanged. These **forecasts were discussed and agreed with the Economic Planning Board (EPB) and KNR and are considered realistic.**

(ii) Passenger Traffic

3.11 Table 6 shows KNR's passenger statistics from 1964 through 1973. During the period 1964-1969, traffic increased by 5.5% per annum in passengers and by 8.5% per annum in pass-km and reached 55 million passengers and 11 billion pass-km in 1969. However, during 1970 and 1971, the long-distance passenger traffic decreased substantially from 9.7 billion pass-km in 1969 to 7.3 billion pass-km in 1971, due to the opening of the Seoul-Busan expressway in 1970 and the introduction of a large number of air-conditioned buses. In 1972, KNR's long-distance passenger traffic began to increase again and reached 9.7 billion pass-km in 1973. The recent increase is attributable to improvements in KNR passenger services, mainly increases in the frequency of limited express train services, and an increase in bus fares in 1972, which meant a wider differential between rail and bus fares in favor of KNR. A detailed analysis of modal competition between rail and road is in Annex 3.

3.12 KNR statistics for commuter traffic show a decline mainly due to changes in the school zoning system in the spring of 1972, which reduced the number of student commuters. However, KNR's commuter statistics record only season ticket holders, and, following the increases in effective commuter rates for February 1972, some passengers resorted to the purchase of regular tickets; the decline, therefore, may be more apparent than real. In 1973, commuter traffic represented 16% of the total number of passengers and about 5% of the pass-km.

3.13 Table 7 shows KNR's passenger traffic forecast from 1974 through 1979, which allows for expected increases in travel demand induced by economic growth, completion of the KNR-operated Seoul Metropolitan Electrified Suburban Railway System (SMESRS), and development of the highway network and highway transport. In 1979, SMESRS's traffic is expected to reach 200 million passengers and 3 billion pass-km, and short-distance passenger traffic on other KNR systems is expected to rise to 100 million passengers and about 3 billion pass-km; long-distance (including military) traffic is expected to increase to about 72 million passengers and 13 billion pass-km. Long-distance passenger traffic is expected to rise slowly since the paving program and the construction of expressways is likely to lead to some diversion of rail passenger traffic, especially on sections other than the Seoul-Busan and the Seoul suburban area.

(iii) Operations

3.14 Table 8 gives a summary of KNR's operating statistics from 1969 to 1973. It shows that operating efficiency and utilization of locomotives and rolling stock continue to be good. However, analyses of the availability of diesel locomotives, passenger cars and freight cars indicate that KNR has ignored their regular maintenance schedule, resulting in a considerable number standing idle and awaiting repair (Annex 4); this, in turn, reduces availability and causes further inevitable ignoring of the maintenance schedule. Consultants (Touche Ross & Co.) recommended the improvement of the maintenance operation. The recommendation has not yet been carried out mainly because of insufficient funds to acquire spare parts, delays in procurement of plant and machinery for workshops and running sheds, and higher than expected traffic increases and consequent demand for rolling stock, resulting in the sacrifice of regular maintenance.

3.15 To restore the maintenance of diesel locomotives, passenger cars and freight cars to normal, KNR will submit to the Bank a detailed, time-phased plan of action, not later than three months after signing of the proposed loan, including the rehabilitation of cannibalized diesel locomotives. The plan of action aims at achieving this by the end of 1977 and proposes raising availabilities to about 85% for diesel locomotives, about 90% for passenger cars and about 93% for freight cars. It will be based on, inter alia, the suggested terms of reference given in Annex 5 and will take into account the recommendations made in the report by Messrs. Touche Ross (June 1971) on maintenance and repairs of diesel locomotives. The

plan of action will also cover the rationalization of the number of major running sheds and of the maintenance work between repair workshops and running sheds. As part of the plan of action, adequate funds, in local or foreign currency as required, would be made available to KNR by the Government on an annual basis to finance the purchase of urgently needed spare parts (Annex 5). To assist in carrying out the plan of action, KNR will appoint a technical adviser for a period of about 2 years.

3.16 In order to improve the quality of its long-distance passenger service, KNR originally planned to purchase 50 additional air-conditioned cars and 150 ordinary cars. However, in view of recent high prices of air conditioned cars, KNR has agreed to limit its requirements to only 150 ordinary cars. In keeping with modern trends in economic design of lightweight passenger cars, the new cars will be specified with a tare weight of not more than 30 tons each.

3.17 To maintain good operating performance and to ensure optimum utilization of the rolling stock, improvements in the signalling system, in marshalling yards and in stations, etc., are needed. These are provided for in the project. KNR's effort to improve operations include the recent introduction of more block trains for coal, cement and containers.

IV. THE PLAN AND THE PROJECT

A. KNR's Investment Plan (1975-1976)

4.01 KNR's original 1975-1976 Investment Plan has been revised in consultation with the Bank in the light of increases in both local and foreign costs, a higher than anticipated traffic growth, and a change in national policy regarding increased utilization of coal reserves following the oil price increases. The revised Plan as agreed between the Government and the Bank comprises investments totalling Won 156 billion (US$322 million) with a foreign exchange component of Won 101 billion (US$209 million). A detailed description of the items included in the Plan is given in Annex 6 and Table 9.

4.02 The Plan as now drawn up assumes continued high utilization and improved availability of passenger and freight cars. Signalling improvements and better yard and terminal facilities with the planned investments should make this possible.

4.03 It has been agreed between the Government and the Bank that no substantial changes in the Plan involving more than Won five billion are to be made without the Bank's prior concurrence.

4.04 KNR has drafted a tentative investment program for the period 1977-1979 amounting to about Won 210 billion (US$432 million) and comprising large capacity extension investments such as track doubling and increases in rolling stock and motive power. Its technical, financial and economic

justification has not yet been established. In view of this the Government has agreed that, before any commitments are made on the items in this program, the Bank will be consulted regarding their technical, financial and economic feasibility.

B. The Project and the Proposed Loan

4.05 The Project to be financed under the proposed loan is KNR's 1975-1976 Investment Plan, excluding those items which are being financed under the Third and Fourth Railway Projects (Credit 183/Loan 669-KO and Loan 863-KO). The proceeds of the Fourth Loan are not sufficient to finance the purchase of all the items originally included. The items for which financing was not available and did not materially affect the objectives of the loan have been deleted, but high priority track maintenance material and equipment, and plant and machinery for workshops and running sheds, estimated at a cost of US$7.5 million, are being included in the Project and will be financed under the proposed loan (Annex 6).

4.06 The Fifth Railway Project includes the completion of the electrification of about 71 km of the industrial lines and the Seoul suburban section, most of which have commenced operation; completion of centralized traffic control (CTC) in Seoul, already started; double tracking of the Ho Nam and Tae Baeg Lines; improvements to marshalling yards; bridge strengthening; acquisition of diesel and electric locomotives and spare parts; acquisition of passenger and freight cars and wheelsets; acquisition of components for heating cars; plant and machinery for workshops and running sheds; provision of the services of a technical adviser; and provision of KNR staff training. Details are given in Annex 6 and Table 10. The proposed loan would cover acquisition of rails, spare parts for motive power, rolling stock and spares, plant and machinery for workshops and running sheds, provision of advisory services, and staff training. The remaining items, including electrification, locomotives, signalling and track works, are being financed by other agencies (para 4.09). There is no retroactive financing.

C. Cost Estimates

4.07 The total cost of the Project is estimated at Won 141 billion (US$292 million equivalent) with a foreign exchange component of US$185 million of which US$100 million would be covered by the proposed loan. The following table summarizes the estimated Project expenditure and items to be financed by the proposed loan.

4.08 The Project costs are based on estimated prices at end of 1974 adjusted for price escalation and physical contingencies. Physical contingencies of about 10% have been included in the Project for all items except those with a particularly firm limit on quantities, such as locomotives and rolling stock. Price contingencies have been included for all items except for local costs on civil works for which firm contracts have already been awarded in 1975 (valued at Won 15 billion). The provision for contingencies on local costs of civil works is an increase of

		Project Expenditure 1975-1976 1/						
		Local	Foreign	Total	Local	Foreign	Total	Loan Items
		₩ billion			US$ million			US$ million
1.	New line construction	0.60	-	0.60	1.24	-	1.24	-
2.	Electrification							
	(a) Industrial lines electrification	0.92	3.05	3.97	1.89	6.29	8.18	-
	(b) Seoul suburban electrification	0.83	1.41	2.24	1.71	2.91	4.62	-
3.	Increase in station and line capacity							
	(a) Signalling	5.55	3.71	9.26	11.44	7.64	19.08	-
	(b) Double tracking (27.3 km.)	4.43	-	4.43	9.14	-	9.14	-
	(c) Other works 2/	9.16	0.81	9.97	18.89	1.68	20.57	1.7 3/
4.	Way and structure renewals and improvements and track maintenance equipment	9.26	7.11	16.37	19.09	14.65	33.74	14.6
5.	Motive power and rolling stock							
	(a) Diesel locomotives (50 new), spare parts and repowering 52 locomotives	0.29	24.43	24.72	0.60	50.37	50.97	8.2 4/
	(b) Electric locomotives (10) and spare parts	0.25	5.64	5.89	0.52	11.63	12.15	-
	(c) Passenger cars (150) and wheelsets	0.11	8.94	9.05	0.23	18.44	18.67	18.5
	(d) Freight cars (2,000) and wheelsets 1/	4.12	17.53	21.65	8.49	36.14	44.63	36.1
	(e) Other 2/	2.60	1.20	3.80	5.36	2.48	7.84	1.4 5/
6.	Motive power and rolling stock repair facilities	0.62	1.26	1.88	1.28	2.59	3.87	2.6
7.	Miscellaneous							
	(a) Technical assistance and staff training	-	0.15	0.15	-	0.30	0.30	0.3
	(b) Other 2/	2.67	0.21	2.88	5.51	0.44	5.95	-
8.	Total 1 to 7	41.41	75.44	116.84	85.39	157.56	240.95	83.8
9.	Contingencies							
	(a) Physical	3.96	2.78	6.74	8.15	5.74	13.89	3.0
	(b) Price	6.30	11.54	17.84	12.99	23.79	36.78	13.6
10.	GRAND TOTAL 6/	51.67	89.76	141.43	106.53	185.08	291.61	100.0

NOTE:

1/ In this table, bridge girders, passenger cars and freight cars except 500 gondola cars procured in 1974, have been assumed as fully imported. (500 gondola cars were procured locally in late 1974 with Government finance and payment is being made in 1975 as part of the project.

2/ See Table 10 for details.

3/ Consists of rails for line capacity increase.

4/ The proposed loan will finance spare parts only. Locomotives financed by US Export-Import Bank.

5/ The proposed loan will finance only equipment for heating cars. Balance for the re-engining of rail cars being financed by Government (on going scheme).

6/ Figures rounded.

16% for 1975 and 14% for 1976 and for equipment and foreign costs of civil works 12% increase for 1975 and 10% increase for 1976. Contingencies, physical and price on all items taken together represent about 17% of Project costs.

D. Financing of the Project

4.09 The financing plan proposed for the Project is summarized below:

	Won Billion	US$ Million Equivalent	%
Government	51.7	106.5	36.5
IBRD Loan	48.5	100.0	34.3
U.S. Export-Import Bank	23.5	48.4	16.6
Kreditanstalt Fur Wiederaufbau (KFW)	4.5	9.3	3.2
European Consortium (for electrification)	10.3	21.3	7.3
Suppliers' Credits and other	2.9	6.1	2.1
TOTAL	141.4	291.6	100.0

4.10 The proposed loan would be to the Government, repayable over 25 years, including a five-year grace period.

E. Execution of the Project, Procurement

4.11 KNR will be responsible for the implementation of the Project. It has the necessary facilities and is competent to carry out the Project.

4.12 Under the Fourth Loan, procurement has been rather slow, due to (i) the lack of qualified staff and (ii) lack of a well defined division of procurement responsibilities between KNR and the Office of Supply of the Republic of Korea (OSROK). To rectify this situation KNR has increased the number of procurement staff and OSROK is strengthening its railway procurement arrangements.

4.13 All items to be procured under the proposed loan, except spare parts needed to build up a stock sufficient for the existing track maintenance machines and those for adequate regular maintenance of diesel locomotives, will be subject to international competitive bidding in accordance with the with the Bank guidelines. Procurement of the spare parts will be negotiated with original suppliers in consultation with the Bank. Their estimated costs are US$0.5 million for track maintenance machines and US$8.2 million for diesel locomotives, making a total of US$8.7 million. Should local bids, in response to international tenders for bridge girders, passenger and freight cars, wheel sets and portal cranes, be successful, local cost financing to the extent of the equivalent of US$27 million would be involved. In bid evaluation, Korea manufacturers of equipment, provided the domestic value added is at least 20% of the ex-factory bid price of the goods in question, will be

allowed a preferential margin of 15% of the c.i.f. cost of competing imports, or the relevant prevailing level of customs duties, whichever is lower.

F. Disbursement

4.14 Disbursements would be made as follows:

100% - of the c.i.f. cost of imported equipment and materials; and/or

100% - of the ex-factory cost of locally manufactured equipment and materials if local bidders are successful;

100% - of the foreign exchange cost of technical assistance.

Any savings under the loan would be used to finance additional, but similar, project items subject to review and agreement with the Bank.

4.15 The items to be financed under the loan and the estimated quarterly rate of disbursement are given in Table 11. Disbursements are based on the assumption that the proposed loan would become effective by July 15, 1975.

V. ECONOMIC EVALUATION

5.01 The original KNR Investment Plan for 1972-1976, as a whole was appraised as the Fourth Railway Project (Loan 863-KO) in 1971-1972. About 50% of the Plan expenditures was allocated to electrification of the industrial lines and of the Seoul suburban area of KNR. Assessment of the original Investment Plan indicated that the total economic benefits would yield an economic return of about 20%. Most of the works related to the electrification have been completed; also the other works have been carried out. From the time of the appraisal of the Fourth Project, traffic increased more than expected; costs of equipment and materials increased sharply; and coal transport has become more important due to the oil price increases. In the light of these circumstances, the Government and KNR revised the KNR Investment Plan for 1975-1976. KNR's revised Investment Plan for 1975-1976 has two important elements:

(a) investments to increase the capacity for coal transport (covering about 32% of the Plan); and

(b) other investments, which cover track renewals and bridge strengthening, track equipment, signalling and telecommunications, purchase of motive power, freight cars and passenger cars, improvement of workshops and sheds, and some yard and line capacities.

These are designed to ensure the efficient operation of KNR by increasing its capacity to handle the growing traffic, limiting to a minimum increases in operating costs and improving the quality of service and safety.

5.02 Investments related to coal transport are intended to enable KNR to carry increasing long-distance coal traffic between the production points in the northeastern part of Korea and the consumption points. The railway is the most efficient means of coal transport since there are no economically feasible alternatives. In 1973, KNR carried 13.6 million tons and 3.2 billion ton-km of coal, and, by 1976, coal traffic will reach 17.6 million tons and 4.1 billion ton-km (against the original 1972 estimate of 13.8 million tons and 3.2 billion ton-km). The substantial increase in coal traffic estimates resulted from the increases of oil prices, which have affected Korea's balance of payments situation adversely. In 1973, petroleum imports, upon which the bulk of the country's energy sources now depends, were estimated at about 110 million barrels, at a cost of US$330 million equivalent (based on c.i.f. prices). In 1974, the total cost of crude oil imports would amount to US$1,200 million; the incremental increase in import bills is equivalent to 80% of the estimated current account deficit for 1974.

5.03 The Government has taken measures to conserve energy in order to save foreign exchange expenditure, and is encouraging coal production. It is estimated that, by increasing coal production by 3 million tons, Korea's savings in crude oil would amount to 12.4 million barrels in 1974, or US$126 million. Thus, each ton of coal would save about four barrels of oil, giving a benefit cost ratio of about 3.3:1 at present prices (Annex 7). The economic benefit of investments in coal transport will, therefore, be in the form of foreign exchange savings. It is expected that these investments, totaling about US$180 million, including that of KNR, would produce gross foreign exchange savings of about US$109 million in 1975 and US$126 million in 1976. Taking into account coal production cost of US$31 million in 1975 and US$38 million in 1976, the first year return on the investment would be over 50%. Even if the price of oil were to be reduced by, say, 30% to about US$7 per barrel, the first year benefit alone would still be a satisfactory 36%.

5.04 Of the other items in the Investment Plan for 1975-76, covering 68% of the total Plan, some are carried over from 1972-1974; they include the electrification works on the industrial lines and the Seoul suburban lines and the procurement of 97 passenger coaches which are excluded from the analysis. The remaining items, covering 59% of the Plan, include purchase of freight cars and passenger coaches; improvement in line capacity by signalling and marshalling yard installations, and by double tracking and increase in crossing loops. Most of these items are intended to increase capacity, but some are strictly replacements; e.g., some freight and passenger cars, track renewals and bridge strengthenings. Benefits deriving from these items would be avoided increases in KNR's operating costs and avoidance of diversion of traffic to other modes at higher cost. Estimating potential vehicle operating cost savings at a conservative 60% of possible savings, the economic rate of return would be about 29%. Assuming that the capital cost of the Project would be higher by 20% and,

at the same time railway operating cost per traffic unit.1/ would be higher by 5%, in real terms, the economic return would still be a satisfactory 21%. Details of the economic evaluation are given in Annex 7.

VI. FINANCIAL EVALUATION

A. Background

6.01 KNR earned profits through 1970, but the situation changed in the following years, due to inflation and inadequate tariff increases. KNR's financial situation has deteriorated and this can jeopardize management's ability to execute the Investment Plan. KNR could operate with continuing losses and maintain a sound financial position if the Government would inject new equity capital into the enterprise, but, it clearly cannot operate with continuing losses if such periodic injections are not forthcoming. Unfortunately, the Government has relied on the exclusive use of debt with resulting increased interest charges and annual debt repayments. This combination of lower earnings and increased debt service has resulted in working capital deficits, prohibiting management from purchasing sufficient materials and supplies to properly maintain the railroad.

6.02 The need to improve KNR's financial situation was noted in the appraisal report and discussed with the Korean authorities during appraisal and negotiations related to the Fourth Railway Project (Loan 863-KO) which was approved in November 1972. In view of the decrease in passenger traffic, slow growth of freight traffic and increased costs in 1970-71, it did not appear that KNR could earn a net income prior to 1975. Accordingly, Section 4.07 of the Loan Agreement did not require KNR to earn a rate of return through 1974 and only 2% in 1975, 3% in 1976, and 5% from 1978 thereafter. In fact KNR's accounts show that the railroad earned a rate of return of almost 1% in 1972, 1.1% in 1973, but no return in 1974. While, in agreement with the Bank, the Government permitted KNR to raise freight tariffs by 25% in 1972 followed, in early 1974, by freight tariff increases of 15% combined with a 25% passenger fare increase, due to the lack of adequate working capital, KNR was forced to ignore maintenance of its motive power fleet and rolling stock thus understating expenses and overstating its rate of return. The urgency of mounting a major maintenance program coupled with financing KNR's future capital expenditures, while costs have grown considerably due to worldwide inflation, makes it imperative for the Government to assist KNR in accelerating its financial recovery. This situation is re-examined later in this chapter together with the specific measures agreed upon to meet this end.

1/ "Traffic unit" = passenger-km/ton/km.

B. Tariffs and Costs

6.03 Tariffs are common throughout the system and are regulated by Government agencies rather than KNR. As part of the Government's policy of exercising controls on the prices of essential commodities, railway tariffs, in particular freight rates, have been held at low levels, the average revenue per ton-km and pass-km being Won 1.8 (US¢0.46) and Won 2.1 (US¢0.53), respectively in 1973.

6.04 Tariff increases granted during the 1967-1973 period were as follows:

	Freight Rates Increase	Average Revenue/ ton-km	Passenger Fares Increase	Average Revenue/ pass-km
		Won		Won
1967	30% (Oct.)	1.19	50% (Oct.)	1.12
1968	-	1.42	-	1.46
1969	- /a	1.52	30% (Dec.)	1.64
1970	-	1.45	-	1.97
1971	-	1.48	-	1.98
1972	20% (Feb.)	1.84	- /b	2.06
1973	-	1.84	-	2.14

/a Changes were made in commodity classification only.

/b There were reductions in commuter ticket discount.

During this period, the wholesale price index in Korea rose by about 9% per annum. While increases in passenger fares were more than rises in costs, there was a decline in freight yields due to traffic increases being mainly in low-rated commodities and to high-rated goods being lost to road transport. In order to meet the requirements of Loan 863-KO, and to help offset increases in fuel costs and wages, the Government allowed KNR to retain, as from February 1, 1974, the 10% transportation tax on passenger fares, which had been in force since 1963, and authorized an increase of 25% in passenger fares from February 13, 1974. Freight rates were raised by 10% from January 1, 1974, by 5% from February 13, 1974 and on December 15, selective increases of between 35% and 40% were made to various classes of freight, excluding coal. This latter tariff adjustment gave an average increase in freight revenues of about 25% to about Won 2.7 (US¢0.55) per ton-km. A further rise of 10% in both passenger fares and freight rates is expected effective in April, 1975.

6.05 KNR's operating costs are low, due to a high degree of utilization of rail facilities and rolling stock and to low salaries and wages. A cost analysis indicates that, during 1972, the average fully distributed costs were about Won 1.7 (US¢0.42) per pass-km and Won 2.4 (US¢0.60) per freight ton-km; these costs are understated, since KNR's provision for maintenance was below the minimum level and the depreciation provision was also inadequate. Nevertheless, the conclusion drawn from comparing these costs

with the revenues given in the above table is that passenger fares have exceeded fully distributed costs, but that freight rates have not. In view of growing road competition for passengers, KNR should correct the present situation of excessive dependence on passenger traffic for its net revenues by raising freight tariffs (para 6.14 and Annex 8).

6.06 A 1970 traffic costing study by consultants (Touche Ross & Co., (Canada)), financed by the Bank, suggested some improvements in KNR's traffic costing procedures. The same consultants have been retained by KNR to implement its commercial accounting system by 1976; improvements in traffic costing procedures will be included. KNR will then have better costing data for management purposes, and during negotiations, agreement was reached on a specific program for implementing the new accounting and traffic costing system by 1976 (para 6.25).

C. Past Performance

6.07 Income statements for the years 1969 through 1973 are given in Table 12 and are summarized below:

	1969	1970	1971	1972	1973
		Billions of Won			
Total Operating Revenues	31.7	33.0	31.2	36.3	41.6
Less: Total Cash Expenses	20.2	23.8	27.8	30.0	34.0
Depreciation	3.6	3.9	4.0	4.5	4.9
Total Operating Expenses	23.8	27.7	31.8	34.5	38.9
Net Operating Revenue (loss)	7.9	5.3	(0.6)	1.8	2.7
Less: Interest Charges	1.6	1.8	3.3	5.8	6.5
Net Railway Revenue (loss)	6.3	3.5	(3.9)	(4.0)	(3.8)
Less: Other Revenue (Expense) /a	(1.8)	(0.5)	(0.7)	0.1	(3.3)
Net Revenue (losses)	4.5	3.0	(4.6)	(3.9)	(7.1)
Add: Government Subsidy (Cash)	-	-	-	-	1.5
Net Income (Adjusted)	4.5	3.0	(4.6)	(3.9)	(5.6)
Net Cash Revenues	8.1	6.9	(0.6)	0.6	0.7
Interest Charge Coverage (times)	4.9	2.9	-	0.3	0.4
Debt Service Coverage (times)	3.4	1.7	0.3	0.5	0.5
Rate of Return on Net Fixed Assets	4.5%	3.0%	-	0.9%	1.1%

/a In 1973, largely a loss on foreign exchange fluctuations.

6.08 Throughout the sixties and including 1970, passenger profitability aided by fare increases was adequate to offset losses on freight operation, and net revenues were sufficient to cover debt service and make some contribution to investment. Examination of KNR's traffic data and yields

indicates that passenger traffic declined by 17% from 1969 to 1971, while freight traffic increased but not fast enough to generate adequate income despite the tariff increases of 1967 and 1972 (para 6.04). While the position has improved slightly since 1971, the fact is the revenue base is insufficient to meet KNR's increasing costs.

6.09 KNR's balance sheets, given in Table 13 are summarized below:

	1969	1970	1971	1972	1973
			Billions of Won		
Current Assets	7.0	7.0	11.7	7.7	9.9
Net Fixed Assets /a	183.4	186.7	196.5	229.8	340.6
Other Assets /b	9.6	17.5	46.3	4.5	6.5
Total Assets	200.0	211.2	254.5	242.0	357.0
Current Liabilities	7.7	10.6	16.4	19.6	18.3
Long-Term Liabilities	32.1	35.0	75.3	80.5	100.5
Other Liabilities	-	-	-	1.0	1.3
Net Equity /a	160.2	165.6	162.8	140.9	236.9
Total Liabilities	200.0	211.2	254.5	242.0	357.0
Net Working Capital (deficiency)	(0.7)	(3.6)	(4.7)	(11.9)	(8.4)

/a Includes a Won 98.7 billion (US$24.7 million) re-valuation of assets in 1973.

/b Other assets include: investments, deposits, deferrals, prepayments.

As shown by the above table, current financial weakness is evidenced by continued large working capital deficits and the rise in long-term debt. Details of the long-term liabilities at December 31, 1963, are given in Table 14.

6.10 Included in the current assets are inventories, valued at Won 4.0 billion at the end of 1973, which have not been physically verified. KNR, with the assistance of its accounting consultants, is presently installing an inventory control system, and has commenced a physical verification of high value items. Deficiencies in the accounting for fixed assets have been consistently pointed out by the Auditors, and have resulted in insufficient provision for depreciation. At negotiations it was agreed that KNR would, by December 1976, carry out a revaluation of fixed assets with a consequent adjustment to annual depreciation.

6.11 When the Fourth Railway Project was prepared, it was agreed that the Bank's agreement should be obtained before KNR incurred any debt, (other than the Government loans to KNR of 1972 and 1973 already indicated to the Bank), should KNR's net cash revenues be less than 1.2 times the maximum debt service requirement. Since then, although KNR's operating results have been slightly better than forecast, net cash revenues have not been sufficient to achieve this ratio. In addition the outstanding debt as of the end of 1973 rose to US$257 million, with a consequent large rise in debt service requirements. The total debt outstanding at end of 1973 included IDA credits and Bank loans amounting to US$84.0 million, Overseas Economic Cooperation Fund (Japan) loans of US$37.4 million, US$51.2 million for electrification from the European manufacturers consortium, U. S. Government Foreign Aid loans of US$21.4 million, miscellaneous foreign loans and suppliers credits of US$13.0 million, and borrowing from the Korea Development Bank equivalent to US$50 million. Although the interest and repayment terms have been reasonable, the present debt service burden is such that future borrowing must be restricted to the minimum requirements. The debt limitation convenant included in the Fourth Railway Loan Agreement was reaffirmed at negotiations.

D. Financial Trends

6.12 In order to put the present in perspective with past results and future prospects, a trend analysis incorporating the growth in KNR's key financial data appears in Table 15 a brief review of which shows several key trends: (i) total operating expenses continuing to increase at a faster rate than total revenues from 1970 until a balance is expected in 1978; (ii) interest charges since 1970 growing over three times as fast as revenues, (iii) KNR's first net loss occurring in 1971 and the railroad is not expecting to return a profit, after all expenses (including interest) until 1978, (iv) KNR's net cash income, i.e., net income plus depreciation less debt service, contributing little or no internally generated funds towards investment from 1971 to 1978, (v) since 1971, KNR incurring long term debt at more than double the rate of the increase in its total resources, (vi) by 1974, KNR's total asset index doubled and is increasing at a faster rate than KNR's ability to generate revenues, (vii) the interest charge index increasing at a more rapid rate than the long term debt index due chiefly to rising interest rates. It is evident that proposals for investment after the project period must be closely examined in the light of benefits, and that the rise in debt must be checked.

E. Future Prospects

6.13 Because of the past inadequate tariff policy, KNR's rates and fares must be raised to a level at which the railway can maintain adequate working capital while meeting all operating costs and debt service. The necessary tariff increases being proposed in Annex 8 have been phased on an annual basis, largely to reduce the impact on the national economy. Those recommended for 1976 and 1977 are necessary to overcome the effects of devaluation of

the won and increases in fuel and other costs in late 1974; the tariff increases proposed for 1978 and 1979 are necessary to cover inflation of about 10% per annum.

6.14 Accordingly, agreement was reached at negotiations that action would be taken, including tariff increases on the lines of those proposed in Annex 8, as necessary for KNR to generate revenues sufficient to enable it to cover all cash expenses, including debt service, by 1978 and to maintain a ratio of current assets to current liabilities of no less than 1.2 by 1979. In order to achieve this it was agreed that KNR should earn rates of return of about 2.1% by 1976, 3.8% by 1977 and about 5.8% thereafter.

6.15 Projected income statements for the years 1975-79, based on assumptions detailed in Annex 8 are given in Table 12. The revenue forecasts take into account the tariff revisions of December 1974. The income statements for the years 1974-79 are summarized below and depend heavily on the execution of the plan for financial recovery.

	1974	1975	1976	1977	1978	1979
			Billions of Won			
Total Operating Revenues	53.8	74.9	96.2	116.1	139.2	152.3
Less: Total Cash Expenses	48.2	63.3	77.6	85.7	95.1	105.6
Depreciation	5.9	7.3	9.2	10.9	12.0	13.1
Total Operating Expenses	54.1	70.6	86.8	96.6	107.1	118.7
Net Operating Revenue (Loss)	(0.3)	4.3	9.4	19.5	32.1	33.6
Less: Interest Charges	6.9	11.9	15.7	24.1	26.2	29.0
Net Railway Revenue (Loss)	(7.2)	(7.6)	(6.3)	(4.6)	5.9	4.6
Add: Other Revenue	1.7	2.7	0.4	0.9	1.3	1.8
Net Revenue (Loss)	(5.5)	(4.9)	(5.9)	(3.7)	7.2	6.4
Add: Government Subsidy	5.9	3.8	-	-	-	-
Net Income (Adjusted)	0.4	(1.1)	(5.9)	(3.7)	7.2	6.4
Total Cash Revenue	6.3	6.2	3.3	7.2	19.2	19.5
Operating Ratio %	102	94	90	83	77	78
Rate of Return %	-	1.1	2.1	3.8	5.9	5.8

6.16 Total forecast operating revenues show a sharp increase in the years ahead due to rising traffic and to tariff increases detailed in Annex 8. As also noted in Annex 8, operating expenses, particularly those associated with the devaluation of the Won in December 1974, are expected to rise due mainly to basic cost increases, with some provision made for a higher level of maintenance and increases in line with the expected rise in traffic. The Government subsidy in the years 1974-1975 is KNR's estimate of the amount to be received from the Government as compensation against revenues foregone due to not implementing a general rate increase in 1973.

6.19 Forecast balance sheets for the years 1974-79, given in Table 13, are summarized below:

	1974	1975	1976	1977	1978	1979
			Billions of Won			
Current Assets	11.8	16.4	20.3	23.7	27.3	30.8
Less: Current Liabilities	15.9	16.2	19.9	22.0	25.2	25.7
Net Working Capital (Deficiency)	(4.3)	0.2	0.4	2.3	3.1	5.1
Net Fixed Assets	377.0	442.7	516.1	556.6	586.7	622.3
Other Assets	25.0	25.0	25.0	25.0	25.0	25.0
Total Assets	397.8	467.9	541.5	582.3	613.7	652.4
Long-term Debt	162.3	203.0	245.5	267.0	280.0	299.5
Provision for Severance Pay	1.9	1.9	2.4	3.0	3.7	4.5
Short-term Finance from Government	-	31.2	67.7	90.1	100.6	112.6
Net Equity	233.6	231.8	225.9	222.2	229.4	235.8
Total Liabilities and Equity	397.8	467.9	541.5	582.3	613.7	652.4

6.18 Carrying out of the actions proposed in paras 6.10, 6.11, 6.14 and 6.21 should result in the net working capital deficits of recent years being eliminated by 1975. This is of critical importance because, while the project provides for much needed spare parts on a one time arrangement, from 1977, KNR will need to generate sufficient funds internally to provide for its increasing annual material requirements in addition to financing increased receivables outstanding. Also the rate of increase in long term debt will slow down with the provision of funds from Government and return to profitability in 1978.

6.19 Table 16 gives ratios for the years 1969 through 1979, incorporating the debt service and rate of return requirements. It shows that KNR should approach the minimal debt service and rate of return requirements forecast in the Fourth Railway Project by about 1977. Debt to equity ratios should increase from 41:59 in 1974 to 56:44 in 1979.

F. Financing the Project and the Plan

6.20 A cash flow statement for the years 1969-1979 is given in Table 17 and is summarized below for (a) the Project period (1975-1976) and (b) the five year period 1975-1979, reconciled to KNR's net working capital position. It takes into account the improvement expected in KNR's operations and cash generation, and the effect of the proposed tariff increases.

Summarized Cashflow
(Reconciliated to Net Working Capital)

	1 Project Period (1975-76)	2 Five Year Period (1975-79)
	Billions of Won	
Source of Funds		
Net Revenue	16.8	106.0
Depreciation	16.5	52.5
Total Generated by KNR	33.3	158.5
Borrowing	100.6	190.4
Funds from Government	67.7	112.6
Operating Subsidies	3.8	3.8
All Other Sources	0.5	2.6
Total Funds Available	205.9	467.9
Funds Required		
Capital Expenditures	155.6	297.8
Repayment of Long-term Debt	16.8	52.6
Loan Interest Charges	27.6	106.9
Total Funds Required	200.0	457.3
Net Increase in Working Capital	5.9	10.6
Net Working Capital:		
Beginning of Period	(4.3)	(4.3)
End of Period	1.6	6.3

6.21 The projections for the project period, given in Column I, illustrate KNR's present inability to generate sufficient capital from operations and consequent heavy reliance on borrowing, together with the necessity for the provision of Government funds. The five-year forecast summarized in Column 2 projects a more favorable situation, with KNR's net working capital returning to a more satisfactory position. The additional borrowing required during 1975-1976 consists of the proposed Bank loan of $100 million (Won 48.5 billion equivalent); US Export-Import Bank, Won 23.5 billion equivalent for diesel locomotives; European manufacturers consortium, Won 10.3 billion equivalent for electric locomotives and ancillary equipment; Federal Republic of Germany finance, Won 4.5 billion equivalent for signalling equipment; miscellaneous suppliers finance of about Won 1.7 billion equivalent, and the drawing down of the remainder of Loans 863-KO, 669-KO, and Credit 183-KO (about Won 12 billion). At negotiations agreement was reached that the Government would provide the funds; (a) as needed to carry out the project and (b) as required by KNR to service its debts, both existing at present and as entered

into subsequently. It was also agreed that the proposed Bank loan to the Government be passed on to KNR on the same terms, i.e. repayable over 25 years including 5 year grace period.

6.22 Investment taken into account during the years 1977-1979 is in line with KNR's proposals, discussed briefly in para. 4.04. These are likely to be modified after further study, and some reductions have tentatively been made, particularly those for track improvements and capacity increases. It is assumed that foreign exchange requirements will be covered by borrowing, on similar terms to Bank loans, and that part of the local currency requirements will be provided by the Government.

G. The Seoul Metropolitan Electrified Suburban Railway System (SMESRS)

6.23 At the time of the Fourth Railway Loan, a subway system was being built to serve the Seoul Metropolitan area. SMESRS is a separate entity under the administration of the Seoul city government. Some KNR suburban services will run over the Subway lines. Section 4.05 of Loan 863-KO provides that KNR shall charge fares on these services sufficient to cover at least their variable costs and that the Government would reimburse KNR for any uncovered portion of their full operating cost. Operations commenced August 15, 1974.

H. Accounting, Budgets and Auditing

(i) Accounting and Budgets

6.24 The KNR still maintains its accounts and prepares its operating forecasts and capital budgets on a cash basis budgetary accounting system, and periodically adjusts such accounts to an accrual basis for financial statement presentation. Thus the commercial accounting system financed under Credit 25-KO is not in satisfactory operation. According to the auditors the books have been set up correctly but lack adequate internal controls, particularly for inventory purchases and issuances, and there has been no physical inspection of inventories and agreement with book records for many years.

6.25 The consultants presently assisting KNR in installing the commercial accounting system are investigating whether this system can be amended to provide financial information in the form required by the EPB, Ministry of Finance and Bureau of Audit and Inspection. It was agreed at negotiations that, KNR would, within 12 months of the date of the Loan Agreement: (a) implement a time-phased program for the completion of the installation of a commercial accounting system acceptable to the Bank and (b) install a traffic costing system.

(ii) Audit

6.26 In accordance with loan requirements that KNR retain auditors satisfactory to the Bank, international firms (latterly with local affiliation) have been auditing KNR's commercial accounts since 1967. However, the requirement that the Bank receive a copy of the audit report not later than five months after the end of each fiscal year has not been complied with - that for 1972 was not received until January 1974. The audit report for 1973 has only recently been received due to the late closing of KNR's accounts. It was reaffirmed during negotiations that audited accounts for 1974 and thereafter will be submitted to the Bank not later than five months after the end of the fiscal year, in accordance with the undertakings in previous Loan Agreements.

VII. AGREEMENTS REACHED AND RECOMMENDATIONS

7.01 During negotiations, agreement was reached on the following principal points:

(a) the submission by KNR within three months of a firm plan of action for maintenance normalization for diesel locomotives, passenger cars and freight cars, and rehabilitation of diesel locomotives presently out of service (para. 3.15);

(b) the provision by the Government to KNR of adequate funds, in local or foreign currency as required, on an annual basis, to finance the purchase of spare parts (para. 3.15);

(c) the consultation with the Bank, after appropriate study regarding the technical, financial and economic feasibility of components of KNR's investment program for the period 1977-1979, before any commitments are made (para. 4.04);

(d) the increase in tariffs and other measures to improve KNR's earnings and working capital (para. 6.14); and

(e) the provision of funds needed to carry out the project, and as required by KNR to service all debt (para. 6.21).

7.02 A condition for loan effectiveness is the submission to the Bank by the Government, of a time-phased program for the effective formulation and review of policies and investment proposals by all its agencies and ministries related to the transport sector, including inter alia, the function, authority, work schedule and staffing of TPO (para. 2.05).

7.03 The project provides a suitable basis for a Bank loan of US$100 million. The proposed loan would be made to the Republic of Korea for a term of 25 years, including a five-year period of grace and on-lent to KNR on similar terms.

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ANNEX I

APPRAISAL OF A FIFTH RAILWAY PROJECT

Summary of the Bank Group Contribution in the Transport Sector

	Year	Project	Amount (US$ Million)	Description
1. Credit 25	1962	Railway	14.0	The project was part of the 1962-1966 Korean Railroad Investment Program and consisted of (i) the completion of the new line (16 km), (ii) the procurement of rolling stock (about 1,400 various cars) and (iii) the establishment of a modern and sound accounting and statistical system for the Railroad. The Bank promoted the autonomy of the railroad agency. Project execution was satisfactory except for implementation of the accounting and statistical system.
2. Grant	1965	Transportation Survey	0.2	The Government appointed BCEOM and NEDECO to carry out an integrated transport survey to recommend a detailed transport investment plan for 1967-1971.
3. Credit 110	1967	Railway	10.7	The project was the first three years of the 1967-1971 Korean Railroad Investment Program and consisted of (i) the procurement of locomotives and rolling stock, (ii) the expansion of line capacity through the renewal and improvement of various facilities and (iii) the improvement of operative efficiency with the aid of consultants. Execution of the project was satisfactory.
4. Preinvestment Study S4	1968	Highway Studies	3.5	The Bank financed the study on highway organization, transportation coordination, technical assistance for implementing highway reorganization, highway feasibility of 1,160 km of roads and detailed engineering of roads with high priority.
5. Loan 669/ Credit 183	1970	Railway	55.0	The project, part of the 1967-1971 Korean Railroad Investment Program, was to help finance diesel locomotives and freight cars and to provide consultant services to study (i) improvement of maintenance of diesel locomotives and railcars, (ii) the construction of a new workshop and (iii) the telecommunication system. There was a problem in freight car procurement in 1971, and procurement of some items has been very slow.
6. Loan 769	1971	Highway	54.5	The project consists of road construction (372 km of national highway), feasibility studies of about 1,400 km and detailed engineering of about 1,100 km of national highways, a highway maintenance study and purchase of highway maintenance equipment. The execution of the project is satisfactory.
7. Loan 863	1972	Railway	40.0	The project, part of the 1972-1976 Korean Railroad Investment Program, was to help finance track materials and equipment, bridge girders and erection equipment, 271 passenger coaches, 5 heavy breakdown cranes, and plant and machinery for workshops and running sheds.
8. Loan 917	1973	Ports	80.0	The project will provide: At Busan - a composite pier with two container berths and stacking area, a grain berth, equipment for handling containers and unloading grain; a bulk handling pier with one coal import berth, two for ores and mineral exports and one for steel imports; cranes and bulk handling systems; dredging of an access channel; a new international ferry berth and rehabilitation of pier 1 for general cargo; coastal ferry berths with passenger facilities; rehabilitation of pier 2 for general cargo. At Mug Ho - new coal pier 3 with improvements to existing conveyor systems and new mechanical loaders; a new belt/reclaimer system in the existing open storage area; dredging at the new coal piers; raising the existing breakwater and strengthening the side slopes; rehabilitation of existing cement and general cargo berths.
9. Loan 956	1974	Highway	47.0	The project consists of (i) construction of 130 km of national highways from Saemal to Gangreung and Gangreung to Mug Ho, (ii) paving of 634 km of national highways, (iii) feasibility studies by consultants for improvement and paving of 1,000 km of roads, and detailed engineering of those roads found to be justified and (iv) procurement of highway maintenance and workshop equipment for the extension of a new national highway maintenance organization from a pilot province to the remainder of the country.

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APPRAISAL OF A FIFTH RAILWAY PROJECT

Government Agencies Concerned with Transportation

I. Ministries

1. The Ministry of Transportation (MOT) is responsible for railroad and civil aviation infrastructure works. It controls transport operations for all modes, issues regulations, delivers licenses, performs cost calculations, sets rates and fares, collects transport statistics and undertakes research. It carries out its activities through four bureaus: Land Transportation, Marine Transportation, Civil Aviation and Tourism; and exerts control over KNR. In May 1973, the Busan-Mukho port unit in MOT was established as an initial step to create an autonomous Korean Port Authority by 1978.

2. The Ministry of Construction (MOC) is responsible for planning, construction and maintenance of national highways and ports, except Busan and Mukho. It controls the Korean Highway Corporation, created in January 1969, which is in charge of constructing, maintaining and operating toll roads. It is also responsible for policy on other roads.

3. The Economic Planning Board (EPB) reviews and makes final decisions on the transport investment programs. The Deputy Prime Minister, who is Chairman of EPB, is advised by the Economic Plan Committee (EPC). EPC is chaired by the Deputy Minister of EPB and is composed of the Deputy Ministers of major ministries and other specially appointed members. Within the EPC, the Transportation and Communication Committee (further subdivided into two subcommittees) is in charge of appraising projects submitted by the ministries and agencies.

4. The Ministry of Agriculture and Forestry is responsible for farm and forestry roads.

5. The Ministry of Commerce and Industry (MOCI) is responsible for promoting and supervising assembly plants for motor vehicles, railway rolling stock and shipbuilding.

6. The Ministry of Finance (MOF) is responsible for establishing and collecting taxes related to transportation.

7. The Ministry of Home Affairs (MOHA) is the highest authority over all local government; it is responsible for administration and execution of work on roads other than national highways; and it administers various taxes, such as the vehicle and the acquisition tax, to help finance transport works by local authorities. MOHA is also in charge of the highway police.

II. Bodies for Transport Coordination

1. The Transportation Coordination Ministers Conference (TCMC) was established in January 1970 in order to coordinate and discuss transport plans and policies at the ministerial level. TCMC consists of the Ministers of EPC, MOC, MOHA, MOF, National Defense, MOCI, MOT and the Minister Without Portfolio, and is headed by the Deputy Prime Minister and the Minister of EPB.

2. The Transportation Coordination Working Group (TCWG) was established in September 1970 as an instrument of TCMC and is intended to provide liaison and information from the ministries concerned at the working level.

3. The Transportation Planning Office (TPO) in MOT was organized in December 1969 for appropriate coordination of the transport sector and is designated as a permanent body to serve as secretariat of TCMC. MOC still retains authority over planning for highways and ports.

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APPRAISAL OF A FIFTH RAILWAY PROJECT

Development of Transport Sector: 1962-1973

A. Introduction

1. Historically the railways and, to a lesser extent, coastal shipping have been the major modes of transportation in Korea. Both suffered serious deterioration during the Second World War and heavy losses during the Korean War. The railways were rehabilitated extensively under the large US aid program of the 1950s, and port capacity was also restored, but coastal shipping revived only in the 1960s, when rapid economic growth created a large demand for transport capacity. The end of political instability and the adoption of sound economic and financial policies after 1962 enabled Korea to achieve large increases in industrial production and exports (the latter were minimal in 1962) during 1962-1973; during this period, GNP increased by about 10% per annum. As part of this growth, freight traffic in ton-km increased annually by an average of nearly 12%, passenger traffic in pass-km by about 13% and international port traffic by about 22%.

B. Freight Traffic

2. The development of commercial freight traffic during 1962-1973 is summarized in the following table (for details, see table 1):

Mode	1962 (Million tons)	1973 (Million tons)	1962 (Billion ton-km)	1973 (Billion ton-km)	1962 (Average Distance in km)	1973 (Average Distance in km)
Railway	17.9	37.8	4.0	8.6	223	228
Road	16.9	72.0	0.4	3.1	24	43
Coastal	2.0	9.7	0.2	4.2	100	432
Total	36.8	119.5	4.6	15.9		
Average					125	133

The railways continued to handle the bulk of freight traffic (54% of the total ton-km in 1973) but there was also a large expansion in road transport and coastal shipping. The railways accounted for 41%, coastal shipping for 35%, and road transport for 24% of the total increase in ton-km during 1962-1973 (30%, 40% and 30%, respecitvely during 1967-1973).

3. The continued preponderance of the railways in freight traffic is explained in large part by location patterns, which make movement by

rail the most economical means of transportation for a large proportion of the total movement of commodities. Domestic natural resources, e.g., coal, iron ore and limestone, are located in the north, northeast and center of the country and require heavy bulk transport to the industrial areas, mainly located in and around Seoul-Inchon and Busan. Thus, about 76% (based on 1973 data) of rail freight traffic consists of bulk commodities. In 1973 anthracite alone accounted for 37% of total rail freight.

4. In addition to this locational factor, the heavy reliance on railways for freight transport is due to the fact that the capacity of the railways has been increased substantially, while improvements to the road network started only a few years ago and the expansion of the road vehicle fleet has been small. The average length of haul of road transport, 24 km in 1962 and 43 km in 1973, indicates that trucking services are mainly for short hauls within urban areas and between urban areas and adjacent rural areas and act as feeder services for the railways and ports. Long distance trucking services have started only recently. Percentage wise, the increase in the number of trucks was very large (from 13,000 trucks in 1962 to 65,000 trucks in 1973) but the absolute number is small for Korea's level of economic development. The small number of vehicles reflects (i) a low capacity of the road network, (ii) restrictions of the importation of vehicles, (iii) slow expansion of domestic car production capacity and (iv) a restrictive licensing policy.

5. The expansion of the highway network during 1962-1969 was unusually small compared with developments in other countries. In line with the recommendations of a 1965 Bank-financed Transport Survey and of Bank economic missions, the Government has greatly increased the allocations for highway construction since 1968. However, although the Survey recommended a program of paving existing roads and improving highway maintenance, a large part of these funds was allocated to the construction of four toll expressways (Seoul-Busan, 428 km; Seoul-Incheon, 29.5 km; Daejon-Jeonju, 79 km; and Suwon-Saemal, 104 km), of which the Seoul-Busan was economically premature in many sections. This resulted in (i) a shortage of funds for maintenance and improvement of the existing roads and (ii) a diversion of passenger traffic from the railways, particularly in 1970 and 1971. There was recently a major policy change in the Government and the emphasis on high standards of road construction was shifted to paving and appropriate construction standards for the traffic levels to be served. Also, the Government is beginning to recognize the importance of road maintenance. Currently, road density is generally sufficient, but the condition of most of the road network is inadequate. Only 15% of roads are paved (33% of the national and 2% of the provincial highways). Furthermore, the unpaved roads are in a poor state.

6. The cost of vehicles is high as a result of the Government's policy of prohibiting the import of all assembled vehicles (except of a small number, in special categories) and requiring the use of an increasing proportion of domestically manufactured components in locally assembled vehicles.

7. The MOT through the Bureau of Land Transportation is responsible for licensing and regulation of highway transport. Licensing of the road transport industry has been restrictive and regulations include (i) issuing licenses only to enterprises having a minimum of 20 vehicles in cities or 10 vehicles in country districts, (ii) imposing quotas on the total number of vehicles in each province, (iii) limiting the use of vehicles to specific areas or routes and (iv) regulation of rates for freight, as well as passenger traffic. The Government recently reviewed its policies concerning the regulation of road transport and in a Policy Statement dated October 5, 1973 indicated an intention to relax present restrictions; during negotiations for the Second Highway Project, the Government agreed to relax them by June 30, 1975.

8. Coastal shipping carried 9.7 million tons and 4.2 billion ton-km or cargoes consisting mainly of oil, coal and cement. Oil is by far the most important commodity, some of which originates at, and is handled by, specific ports.

C. Passenger Traffic

9. The development of commercial passenger traffic during 1962-1973 is summarized in the following table (for details, see Table 1):

Mode	1962 (Passengers	1973 (millions)	1962 Pass-Km	1973 (billions)
Railway	100.6	143.0	5.9	10.7
Road	667.1	3,855.8	5.5	32.1
Coastal	4.4	7.2	0.2	0.4
Air	-	1.3	-	0.4
Total	772.1	4,007.3	11.6	43.6

The railways still continue to handle substantial passenger traffic (24% of the total pass-km in 1973) but there was a large increase in road transport. Available data on road passenger traffic from 1969 to 1973 indicates that a large part of the passenger traffic was carried by intra-city and inter-city buses. The table below summarizes the characteristics of passenger traffic on the roads in 1973:

	Number of Passengers (million)	Pass-Km (billion)	Average Distance Traveled (km)	Number of Vehicles
Expressway bus	37.3	5.7	15	725
Inter-city bus	443.9	12.0	27	6,900
Intra-city bus	2,428.6	10.7	4	7,907
Micro-bus	2.6	-	-	-
Taxi	930.1	3.1	3	29,647
	3,842.5	31.5	8	45,179

Inter-city buses are operated on about 4,000 routes of which about 2,400 have less than 50 km route-km and only about 100 operate at longer than 200 route km. Out of 7,907 intra-city buses, about 4,500 are registered in Seoul; about 1,300 in Busan. Except for expressway bus services, road passenger traffic generally does not compete with railway services.

10. The evolution to a multi-mode transport system started in passenger traffic in 1969; this meant long and intermediate distance rail vis-a-vis expressway bus competition. The use of expressway buses followed the completion of expressways:

Sections	Distance (km)	Date of Completion	Number of Bus Routes	Number of Buses Operating
Seoul - Inchon	295	December 1968	1	31
Seoul - Busan	428	July 1970	24	443
Dae Jeon - Jeon Ju	79	December 1970	10	178
Su Weon - Saemal	104	October 1971	5	38
Jeon Ju - Sun Cheon	189	November 1973	n/a	n/a
Busan - Sun Cheon	177	November 1973	6	60

While the number of railway passengers, particularly on the Seoul - Busan sections, decreased considerably in 1970 and 1971, the total expressway bus passenger traffic increased from 1.9 billion pass-km in 1970 to 5.6 billion pass-km in 1973.

11. The major factors which affect the relative use of expressway buses and rail passenger services seem to be the fares charged, the frequency of services, and the degree of comfort offered to the passengers. KNR ran no less than 22 passenger trains a day each way between Seoul and Busan in 1973 (for parts of this line the number is much greater) and 14 of these, three super express trains and eleven limited express trains, are as fast as the expressway buses. The expressway buses, however, are more frequent, and the fares charged currently by buses are similar to those of the limited express train even though buses offer airconditioned accommodations.

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APPRAISAL OF A FIFTH RAILWAY PROJECT

Description of Railway Property

A. Railway Lines

1. At the end of 1973, KNR operated 3,086 route-km of standard gauge (1,435 mm) and 47 km of narrow gauge (760 mm) lines, mainly single track; 529 km are double track (see Map). The double track main lines have gradients not exceeding 1% and curves of 400 m minimum radius. There are many sections in mountainous areas; over 40% of the network has gradient over 1% with some sections of 2.5% and 3%. There are numerous curves, 140 km of tunnels and 97 km of bridges. Several of the bridges need strengthening, which is being executed under the **Fourth Loan.** KNR plans to continue the bridge strengthening.

2. The total length of track, excluding about 1,441 km of siding, is 4,100 km mainly laid with 50 kg/m and 37 kg/m rails. All renewal of principal lines is now with 50 kg/m rails. Some 90 km of track on the Seoul-Busan line have welded rails and 47% of the track has pre-stressed concrete sleepers. Most of the track is laid with 22 cm of ballast with shingle collected from river beds. The ballast is not clean and contains about 30% of soil. With the growth of traffic, KNR has carried out in the past, rail renewals on a programmed basis and adopted mechanized track maintenance. During 1976, KNR plans to carry out complete renewal of 80 km of track, after acquiring mechanized track renewal equipment.

3. Signalling arrangements consist of color lights in the Seoul area and electric block instruments on most main lines. Centralized Traffic Control (CTC) was installed on the single line of heaviest traffic between **Mang U (near Seoul) and Je Cheon (155 km).** Automatic block signalling installed between Seoul and Dae Jeon on the Seoul Busan line will be extended to Busan (about 180 km). Automatic train stopping system for safety has already been introduced and will be further extended. About 80% of the 349 km single track railway lines connecting the northern mountainous region with Seoul (industrial lines) has already been electrified; the remaining 70.5 km are expected to be electrified by June 1975.

B. Motive Power and Rolling Stock

4. KNR's motive power and rolling stock position at the end of 1973 is given in the table at the end of this Annex. The fleet consisted of 433 locomotives (60 steam, 336 diesel and 37 electric), 133 diesel railcars,

1,577 passenger cars, and 16,269 freight cars. During 1974 KNR acquired 29 additional electric locomotives (making a total of 66 electric locomotives) for operation on the electrified industrial lines and 126 electric railcars for operation in the Seoul suburban electrified area.

5. The high percentage of availability of diesel locomotives indicated by KNR, (89%), and of passenger cars (87%) has been achieved by deferring scheduled systematic maintenance. Inadequate maintenance of locomotives has resulted in frequent locomotive failures on the run (about five daily). The availability of freight cars has deteriorated from 89% in 1971 to 87% in 1973. Consultants (Touche Ross & Co., Canada), who made studies financed under the Third Loan, recommended improvements in the maintenance operation for running stock but they have not yet been carried out because of lack of spare parts and repair facilities. With the rapid traffic growth, KNR has been forced to fully utilize its running stock intensively at the sacrifice of regular maintenance. KNR is aware of this serious situation and has planned the re-engining of 52 diesel locomotives (General Motors), and the acquisition of spare parts for two years, 1975 and 1976 and of about 200 wheelsets for passenger cars and about 2,000 wheelsets for freight cars.

6. A coherent plan of action for maintenance normalization for locomotives and rolling stock should be prepared and implemented by KNR with the assistance of a technical adviser and also a schedule of rehabilitation of diesel locomotives is necessary. Suggested terms of reference for such a plan of action (which will also take into account the recommendation of Touche Ross regarding maintenance of diesel locomotives) is given in Annex 5. To meet the traffic growth, KNR plans to acquire a further 50 diesel locomotives (financed by a U.S. Export-Import Bank loan) and 24 electric locomotives (from a consortium of European manufacturers). While the introduction of these diesel locomotives would have made it possible to replace some of the existing steam locomotives, replacement of steam locomotives with diesel locomotives previously planned for 1974 will not be done until arrears of maintenance is overtaken. Therefore, some 16 diesel locomotives will be used as reserve for faster withdrawal of existing diesel locomotives from service for carrying out deferred maintenance.

7. To improve the low availability of diesel railcars (60% in 1974) the re-engining of 90 railcars is underway and financed on loan terms by the Government (Korean Foreign Exchange); of the 90 re-enginings, 70 are expected to be completed in 1975. KNR expects to increase the availability of railcars to about 85% by end-1976.

8. About 340 passenger cars are in poor condition, out of which about 100 would be scrapped during 1975-76. KNR plans to acquire a further 150 ordinary passenger cars during 1975-76. The tare weight to be adopted in the future for ordinary passenger cars was discussed with KNR engineers during the mission. In view of the merit of passenger cars of light weight design, the 150 ordinary passenger cars to be acquired during 1975-76 will have a tare weight of not more than 30 tons each.

9. About 1,400 freight cars are in poor condition. In 1974 KNR acquired 500 gondola freight cars financed by the Government. In addition, during 1975-76 KNR plans to acquire 400 box cars, 500 gondola cars and 600 hopper cars and to receive 387 privately owned tank cars. About 218 freight cars would be scrapped during that period.

10. KNR plans to improve its heating car fleet for heating passenger trains. The improvement during 1975-76 consists of: (i) the conversion of 25 passenger cars into heating cars by installing steam generators and diesel powered blowers; and (ii) the replacement of old oil burners in 13 existing heating cars with equipment as in (i).

C. Telecommunications

11. Much of KNR's telecommunications network has reached the end of its expected life. Under the Third Loan, KNR planned to install a microwave system between Busan and Seoul. The bid for microwave equipment was opened in March 1974 but the bid evaluation was not in accordance with Bank guidelines. New bids are now under scrutiny.

D. Double Tracking

12. The double tracking of the Ho Nam line (88.6 km) has been partially completed (25.4 km) and a further 21 km is expected to be completed by 1974. KNR's recent passenger and freight traffic forecast on this line indicates that the double tracking would be necessary for the remaining 42.7 km of which 21 km have now been planned. The national policy regarding greater utilization of coal as source of energy and the consequent increase of rail transport of coal has prompted the partial double tracking between Ye Mi and Jo Dong (6.3 km) on the Tae Baeg line, which is planned for 1975.

E. Marshalling Facilities

13. Marshalling facilities in yards and stations are generally inadequate in relation to the expanding traffic and for increased block train operations. Further improvements are planned.

F. Workshops

14. KNR has four main workshops at Seoul (electric locomotive, passenger cars, freight cars and electric and diesel railcars) Yeong Deung Po (steam locomotives, passenger cars and freight cars) Busan (diesel locomotive, passenger cars and freight cars) and Incheon (passenger cars and freight cars). According to earlier plans the work in these workshops was to be rationalized and a new workshop at Dae Jeon for freight car repairs was to be constructed. In the latest proposals, the location of the new freight car workshop has been changed to Hae Dok. The old plant and machinery in the existing workshops will be modernized and augmented. Out of the 17 diesel locomotive

repair sheds, seven will be retained with added equipment like portal cranes for lifting locomotives. However, the need for seven diesel locomotive repair sheds and rationalization of work between major running sheds and repair workshops will be further examined as part of the plan of action for satisfactory maintenance of motive power. Generally, the standard of repair work done in the workshops and running sheds is poor and needs great improvement.

G. Other Property

15. In general, the buildings, stations, offices and general plant of the railways are well maintained. However, some improvements are needed in certain station and yards; these are now planned.

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Composition of Motive Power and Rolling Stock as of December 31, 1973, with 1974, 1975 and 1976 Forecast

	Actual 1973	Forecast 1974	Forecast 1975	Forecast 1976	Increase (+) or Decrease (-) during 1975-76
1. Motive Power					
Steam Locomotives	60 1/	60	60	60	0
Diesel-Mainline Locomotives	301	301	341	351	+50
Diesel-Shunting Locomotives	35	35	35	35	0
Diesel Railcars	133	133	133	133	0
Electric Locomotives	37 2/	66	66	76	+10
Electric Railcars	-	126	126	126	0
Sub-Total	566	721	761	781	+60
2. Passenger Car Stock					
Passenger Cars	1,577	1,725	1,798	1,833	+108
Heating Cars	141	141	151	166	+ 25
3. Freight Car Stock					
Box Cars	5,333	5,253	5,343	5,443	+190
Gondola/Hopper Cars	6,670	6,880	7,420	7,980	+ 1,100
Tank Cars	2,253	2,276	2,451	2,633	+357 3/
Flat Cars	1,440	1,402	1,360	1,315	-87
Container Cars	100	118	152	187	+69
Other	473	498	523	538	+40
Sub-Total	16,269	16,427	17,249	18,096	+ 1,669

1/ Excluding 33 steam locomotives stored in either workshops or running sheds.
2/ In addition, KNR had 20 electric locomotives under test runs as of end-1973.
3/ Comprising the purchase of 387 privately owned cars followed by scrapping of 30 during 1975 and 1976.

Source: KNR and mission estimates

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Suggested Terms of Reference of a Plan of Action for Maintenance Normalization for Diesel Locomotives, Passenger Cars and Freight Cars

1. Objective

The objective of the Plan of Action is to restore the maintenance of locomotives, passenger cars and freight cars to generally accepted standards and thus improve their availability according to targets laid down below. The early rehabilitation of cannibalized diesel locomotives will also be part of the Plan of Action. A technical adviser will assist in the implementation of the Plan of Action.

2. Target for Restoration of Maintenance

To achieve this objective, the target date shall be December 31, 1977.

3. Target Indicators to be Achieved by December 31, 1977

The targets to be achieved are:

Type of Stock	Ratio of Planned Scheduled Maintenance to Actual	Availability (%)
Diesel Locomotives	1.00	85
Passenger Cars	1.00	90
Freight Cars	1.00	93

4. Normal Maintenance

The planned schedule of normal maintenance for diesel locomotives will include, all the schedules for inspection recommended by manufacturers. For passenger cars and freight cars the planned schedules will include all periodical inspections specified by the Railway Administration.

5. Availability

In working out the percentage of availability of locomotives, all time spent on repairs and maintenance in shops and running sheds shall

be taken into account as under or awaiting repair. Similarly, for passenger cars and freight cars, time spent in workshops on repairs and maintenance and in inspection and maintenance in maintenance depots will be counted as under or awaiting repairs.

6. Reserve of Diesel Locomotives

A reserve of 16 diesel locomotives will be kept to enable KNR to achieve the planned schedule of maintenance and availability of diesel locomotives. The reserve will be built up as follows:

(a) out of the 40 diesel locomotives to be delivered in 1975, 12 locomotives will be designated as reserve and not included in the working units;

(b) out of the 10 diesel locomotives to be delivered in 1976, 4 will be designated as reserve and not included in working units.

7. Adequate Funds

For the two years commencing October 1975, and ending September 1977, the following funds in local and foreign currency will be made available by the Government to KNR to finance the purchase of urgently required spare parts:

(a) Diesel Locomotives - not less than Won 4.4 billion (US$9 million);

(b) Passenger Cars - not less than Won 2.0 billion (US$4.0 million);

(c) Freight Cars - not less than Won 3.0 billion (US$6.0 million).

For the subsequent years the funds to be made available to KNR for the same purpose on an annual basis will be as follows:

(a) Diesel Locomotives - not less than Won 2.2 billion (US$4.5 million);

(b) Passenger Cars - not less than Won 1.0 billion (US$2.0 million);

(c) Freight Cars - not less than Won 1.5 billion (US$3.0 million).

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Description of the 1975-76 Plan and the Project - Main Items

The Investment Plan to be implemented during the period 1975-76 is estimated to require an expenditure of about Won 156 billion, including contingencies. The Project consists of that part of KNR's Investment Plan 1975-76, for which Bank financing is not provided under the Third and Fourth Railways Loans, and is estimated to require the expenditure of about Won 141 billion, including contingencies. The main components of the Investment Plan and the present Project are:

Part A: New Line Construction (The whole of this item forms part of the Project)

Completion of the construction of coal sidings (Gio Han area about 5 km) and industrial sidings (Suncheon area about 3 km).

Part B: Electrification (The whole of this item forms part of the Project)

(a) Completion of the electrification of about 71 km (Gio Han to Bug Pylong);

(b) Completion of the Seoul suburban area electrification.

Part C: Increase in Station and Line Capacity (The whole of this item forms part of the Project)

(a) Installation of signalling, including the Centralized Traffic Control (CTC) system in the Seoul area, automatic block signalling between Dae Jeon and Busan (about 180 km), automatic train stopping system, station signalling improvement (about 15 stations) and railroad level crossing improvement (about 25 places);

(b) Continuation of the work on the double tracking of the Ho Nam Line (about 21 km) and completion of the work on the partial double tracking of the Tae Baeg Line (about 6 km);

(c) Completion of the construction of the Hae Dok (about 500 cars daily), Je Cheon (about 580 cars daily) and Bu Gok (about 600 cars daily) marshalling yards;

(d) Completion of the extension of station yards (7 yards);

(e) Construction of station buildings (3 major stations and others);

(f) Construction of bypass lines (about 2 junctions);

(g) Construction of crossing loops (about 15 stations);

(h) Lengthening of crossing loops (about 10 stations).

Part D: Way and Structure Renewals and Improvements (The whole item excluding parts of Items (a) and (g), forms part of the Project.)

(a) Rail renewal (about 286 km), of which only 156 km forms part of the project;

(b) Complete track renewal (about 80 km);

(c) Point and crossing improvement (about 390 sets);

(d) The provision of pre-stressed concrete sleepers (about 152,000);

(e) The provision and placing at site of ballast (about 500,000 cu m);

(f) The provision and placing in service of track maintenance equipment and the provision of spare parts for track maintenance equipment purchased under Credit 183/Loan 669-KO and Loan 863-KO;

(g) Renewal of bridges (about 8,346 tons of which only 5,900 tons form part of the Project.

Part E: Motive Power and Rolling Stock (The whole item except part of Item (c) as indicated, forms part of the Project.)

(a) The provision and placing in service of 50 diesel locomotives, the re-powering of about 52 diesel locomotives, and the provision of spare parts for diesel locomotives;

(b) The provision and placing in service of 10 electric locomotives 1/ and the provision of spare parts for electric locomotives;

1/ KNR has placed an order for 24 Electric Locomotives before obtaining the approval of the Bank as required by Section 3.09 of Loan 863-KO.

(c) The provision and placing in service of 228 ordinary passenger cars and 19 special passenger cars and the provision of about 200 wheelsets for passenger cars, of which only 150 passenger cars and 200 wheelsets for passenger cars form part of the Project;

(d) The provision and placing in service of 400 box cars, 1,600 gondola cars 1/, and the provision of about 2,000 wheelsets for freight cars;

(e) The rebuilding of about 25 heating cars and the replacement of heating equipment of about 13 heating cars;

(f) The rebuilding of about 50 container cars and about 200 cabooses and re-engining of about 20 diesel rail cars.

Part F: Motive Power and Rolling Stock Repair Facilities (This item forms part of the Project except for modernization of workshops at Seoul, Busan, Incheon and modernization of freight car workshop at Je Cheon and Ka Ya (Busan).

(a) Modernization of existing running sheds at Dae Jeon, Je Cheon and Ka Ya (Busan) and of the existing workshops at Seoul, Busan and Incheon;

(b) Modernization of the freight car workshops at Je Cheon and Ka Ya (Busan), and construction of the freight car workshop at Hae Dok.

Part G: Miscellaneous (This item, except for (d), parts of (a), and of (e), forms part of the Project as indicated:)

(a) The provision and installation of microwave equipment between Seoul and Busan, and the extension of train radio system, of which only the extension of train radio system forms part of the Project;

(b) Modernization of electric lighting facilities at passenger stations;

(c) The provision of the services of a technical adviser for normalization of maintenance for diesel locomotives, passenger cars and freight cars;

(d) The provision of consultants' services for accounting modernization and telecommunications and inventory control. This item does not form part of the Project;

1/ Out of 1,600 gondola freight cars 500 cars were financed by the Government and brought into use in 1974; payment for these cars is included in the Project.

(e) The provision of training for the KNR staff in accounting, the use of track maintenance equipment and microwave equipment and of plant and machinery for workshops and running sheds, and maintenance of diesel locomotives, passenger cars and freight cars. The training in accounting and in the use of microwave equipment do not form part of the Project;

(f) As part of the Plan of Action for normalization of maintenance KNR will submit to the Bank, for its review, a training program, including number, categories and levels of personnel to be trained, approach to training and resources required for its implementation.

The Project is expected to be completed by June 30, 1977.

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Economic Analysis

A. Introduction

1. This Annex analyzes KNR's Investment Plan for 1975-1976 in two parts. The first concerns the increased role of KNR as a part of the national policy to substitute coal for oil. The second concerns the economic analysis of investment items other than coal-related investments.

B. Role of KNR and the Oil Price Increases

Energy Consumption

2. The total energy consumption in Korea in 1973 is estimated at the equivalent of 50 million tons of coal. Of this total, the transport sector consumed about 25% of the country's petroleum products and about 13% of the total energy consumption in the country.

3. Petroleum products provide about 53% of the total energy sources and they require crude oil imports of about 110 million barrels annually at a cost of US$330 million (based on 1973 c.i.f. prices). In 1974, the total cost of oil imports would amount to US$1,100 million, about four times higher than in 1973, due mainly to the increase in the c.i.f. price of oil to US$10.20 per barrel. The current account deficit for the country in 1974 is expected to be about US$1.2 billion, the bulk of which is attributable to the increase in crude oil prices. Under these circumstances, Korea has decided to make every effort to save foreign exchange expenditures by reducing crude oil imports.

Energy Plan

4. Following the increase in oil prices, the Government took wide-ranging conservation measures including allocation arrangements for certain uses. Domestic prices of petroleum products were raised markedly in stages from late 1973; the Government is encouraging coal production and consumption through subsidies and improvements in marketing systems. In early 1974, the Government adjusted its original energy plan for the Third Five-Year Plan period (1972-1976). The revised energy plan calls for more coal production and consumption in industry and households than originally estimated, and less petroleum products production and consumption than initially expected:

	1974 (%)		1976 (%)	
	Original	Revised	Original	Revised
Coal	25.9	29.6	24.3	29.1
Petroleum Products	60.7	56.1	64.5	59.1
Hydroelectric	1.5	1.4	1.8	1.9
Others	11.9	12.9	9.4	9.9
	100.0	100.0	100.0	100.0

This means that coal consumption in 1976 would now be estimated at 19 million tons as against 15.9 million, and that of petroleum products consumption at about 39 million tons (coal equivalent) as against 42 million.

Economic Return Calculations

5. In order to increase coal production and to improve the distribution system, substantial investments are required as the present capacity of mining, storage facilities, and KNR is fully utilized. The Government envisages a total investment of about US$180 million, with a foreign exchange component of about US$95 million for 1975 and 1976. Of this KNR investments would amount to US$99 million, with a foreign exchange component of US$58 million. KNR's investments include only items related to coal transportation, such as gondola cars, some diesel and electric locomotives, bridge and track strengthening, capacity increase in station yards, and rail renewals.

6. Economic savings would be generated from a decline in crude oil imports due to substitution of coal for petroleum products as energy sources. Incremental increases in coal consumption over and above the original estimates would be 2.6 million tons in 1975 and 3 million tons in 1976. Based on 1973 data that 110 million barrels of crude oil imports produced petroleum products of the equivalent of 26.7 million tons of coal, and assuming that the petroleum product mix in 1973 remains constant for the future increases in coal production would substitute 10.7 million barrels of oil in 1975 and 12 million barrels of oil in 1976 and thereafter. These are equivalent to savings of US$109 and $126 million, respectively, based on the c.i.f. price of crude oil of US$10.20 per barrel in 1974.

7. Based on the investment costs including KNR's, of about US$179 million, savings in crude oil of US$109 million in 1975 and US$126 million in 1976, and additional production costs of coal amounting to US$31 million in 1975 and US$38 million in 1976, the investments would bring substantial economic benefits to the country. Each ton of coal would substitute for about 4.1 barrels of oil, thus resulting in a benefit cost ratio of about 3.3 and a first year return on the investment of over 50%.

C. Other Investment Items

8. The table at the end of this Annex quantifies the economic return on the other investment items. They cover the purchase of freight car and

passenger coaches, and motive power, track renewals and bridge strengthening, track maintenance equipment, signalling, improvement of workshops and sheds, and some yard and line capacity increases. Economic benefits in the form of transport cost savings would be generated by improving KNR's operating efficiency, and increasing KNR's capacity, thereby avoiding diversion of traffic to other modes, particularly road transport, at higher costs.

9. The major variables involved in calculating the economic benefits are (a) cost savings in railway operation by the execution of the Plan, (b) the economic cost of road transport, and (c) the volume of traffic which would have to be diverted from the railways because of present capacity limitations. Coal-related costs and traffic discussed in the preceding section are excluded from the analysis. Increases in railway operating cost (in real terms) are estimated at about 0.5% per year.

10. Economic costs of alternative transport, i.e., road transport, are based on 1973 data prepared by BCEOM in conjunction with "Highway Maintenance Study," and adjusted to 1975 prices, taking into account the new gasoline and diesel prices and other factors. Economic operating costs of trucks and buses are:

Truck (6 ton) (vehicle-km)		Bus (vehicle-km)	
1973	1975	1973	1975
Won 81.08	Won 117.75	Won 95.04	Won 120.27

Major factors for increases in operating costs are increases in fuel and engine oil and tire costs. Following the oil crisis domestic prices of petroleum products were raised in stages by 73% up to 80% from late 1973, tire cost went up substantially.

11. Considering the load factor and the efficiency of road transport industries and the quality of the roads, the economic analysis applies very conservative vehicle operating costs: Won 12.00 ton-km of trucks and Won 3.60 per pass-km for buses.

12. Based on the investments amounting to about Won 73 billion in real terms, or US$183 million, the economic benefits in the form of transport cost savings would yield an economic rate of return of about 29%. The estimated economic rate of return would vary, depending upon alternative assumptions for major variables in the analysis. Assuming that the cost of the investment would be higher by 20% and, at the same time, railway operating cost per traffic unit would be higher by 5%, in real terms, the economic return would be about 21%.

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Economic Return Calculations for Other Items
(Unit: Won million)

Year	Capital Cost (1) *	Transport Cost Savings (2)							Net Benefits (2) - (1)
		Passenger Costs (A)			Freight Costs (B)			Sub-Total (A)+(B)+(C)	
		(Pass-km) in million	x (Unit Cost) in Won	= Cost Savings	(Ton-km) in million	x (Unit Cost) in Won	= Cost Savings		
1975	31,736	508	3.60	1,827	482	12.00	5,789	7,616	-24,120
1976	41,505	1,355	3.60	1,880	960	12.00	11,520	16,403	-25,105
1977	-	1,355	3.60	1,880	960	12.00	11,520	16,403	16,400
1978-2001	-	1,355	3.60	1,880	960	12.00	11,520	16,403	16,400

Economic Return = 29.2

* Excludes effects of devaluation of the Won in December 1974

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Financial Forecasts - Principal Assumptions

General

1. All suggested rate increases used in this appraisal should be considered as a minimum. It is further assumed, although not taken into account in the projections, that if:

(a) inflation, worldwide or domestic, exceeds 10% per year;

(b) additional investment programs are placed into effect during the 1975-79 period over and above the current project (1975-76) and that proposed by KNR in the years 1977-79; and

(c) there are any unforeseen cost overruns associated with the proposed project.

then the Korean Government would permit additional tariff increases over and above those indicated below and would provide additional funds over and above the Won 112 billion currently forecasted as being required over the period 1975-1979.

Traffic

2. Traffic will increase as forecast in Tables 5 and 7.

Revenues

3. The Government shall permit KNR to raise its tariffs by no less than the following percentages over the following years:

	Passenger	Freight
1975	10%	10%
1976	10%	15%
1977	10%	20%
1978	10%	10%
1979	-	5%

Operating Expenses

4. Personnel numbers as forecast by KNR. Wage levels increased as forecast by KNR, by 30% in 1975, followed by annual increases of 12-15%.

5. The forecasts include KNR's fuel cost estimate which was based on a reasonable engine kilometer projection by type of power, in relation to anticipated traffic increase, together with the increases of December 1974 in fuel oil and electricity prices plus a 5% annual increase in fuel cost.

6. The level of cost of spares and other materials was increased annually by 10% over the years 1976-79, with further annual increases in line with traffic increases.

7. General and Administrative Expenses were estimated at about 15% of total cash operating expenses over the five-year period in line with previous experience.

8. Annual depreciation was calculated at 2.5% of KNR's net depreciable assets, i.e., the value of gross fixed assets (including track) less the value of land, at cost, in line with previous experience.

9. Interest charges were forecast on the basis of existing loans plus estimated rates for new foreign borrowing.

Balance Sheet

10. Receivables apply only to freight services whereas passenger service is currently on a cash basis. As such, receivables were forecast on a 60-day basis or 17% of total freight revenues.

11. Inventories were forecast at about 13-14% of total operating costs.

12. Accounts payable were forecast on a basis of 60 days of total cash expenses.

13. The Government will provide cash as follows:

1975	-	Won 31.2 billion
1976	-	Won 36.5 billion
1977	-	Won 22.4 billion
1978	-	Won 10.5 billion
1979	-	Won 12.0 billion
TOTAL	-	Won 112.6 billion

The forecasts also assume Government's granting of a cash subsidy to KNR of Won 3.8 billion in 1975 as explained in para 6.16.

Debt service will be assumed by the Government until KNR's earnings are sufficient to resume this burden.

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TABLE 1

Traffic Data: 1962, 1965-1973

I. DOMESTIC TRAFFIC BY MODE	1962	1965	1966	1967	1968	1969	1970	1971	1972	1973
1. Freight (Million tons)										
Railway	17.9	22.4	24.1	27.4	28.9	30.6	31.6	32.0	31.5	37.8
Highway	16.9	24.0	24.5	28.6	46.1	56.6	61.8	73.9	58.7	72.0
Coastal	2.0	2.7	2.7	4.2	5.6	8.1	10.5	11.3	8.8	9.7
Total	36.8	49.1	51.3	60.2	80.6	95.3	103.8	117.2	99.0	119.5
2. Freight (Billion ton-km)										
Railway	4.0	5.0	5.5	6.2	6.9	7.3	7.7	7.8	7.2	8.6
Highway	0.4	0.5	0.6	0.7	1.1	1.3	1.4	3.3	2.5	3.1
Coastal Shipping	0.2	0.3	0.7	1.0	1.4	2.1	4.2	4.7	3.9	4.2
Total	4.6	5.8	6.7	7.9	9.3	10.7	13.4	15.8	13.6	15.9
3. Passenger (Million pass)										
Railway	100.6	107.2	138.3	152.0	151.0	154.7	131.0	128.2	137.1	143.0
Highway	667.1	1,195.5	1,511.6	1,674.8	2,018.9	2,418.6	2,743.8	3,024.2	3,308.5	3,855.8
Coastal Shipping	4.4	5.5	5.9	6.7	6.5	6.1	5.9	6.4	6.3	7.2
Air Transport	-	0.2	0.2	0.2	0.3	0.6	0.9	1.1	1.1	1.3
Total	772.0	1,308.04	1,656.0	1,833.7	2,176.7	2,580.0	2,881.5	3,159.9	3,453.0	4,007.3
4. Passenger (Billion pass-km)										
Railway	5.9	6.9	8.7	9.6	10.6	11.1	9.7	8.8	10.1	10.7
Highway	5.5	8.0	11.5	11.7	13.9	16.7	20.0	22.9	26.3	32.1
Coastal Shipping	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.4
Air Transport	-	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.4
Total	11.5	15.1	20.4	21.5	24.8	28.2	30.3	32.2	36.9	43.7
II. OTHER TRAFFIC										
1. Port (Million tons)										
Exports	0.8	1.6	1.7	1.8	2.3	2.9	3.6	4.2	6.0	8.0
Imports	3.7	5.2	6.8	9.7	13.5	17.1	18.7	24.3	24.7	31.9
Coastal Shipping	3.1	14.6	4.6	8.3	11.2	16.2	21.0	22.5	17.6	17.9
Total	7.5	11.3	13.0	19.9	27.0	36.2	43.3	51.0	48.3	57.8
of which Inchon (%)	17.3	12.2	14.7	14.8	15.2	15.1	18.5	18.0	19.7	21.0
Pusan (%)	43.4	38.5	40.4	32.0	26.1	22.2	21.3	21.4	24.0	23.0
2. Air ('000 passengers)										
International - In	18	37	65	87	112	133	191	241	372	666
- Out	20	40	66	88	116	135	201	267	400	703
Domestic	48	207	192	215	312	627	909	1,105	1,121	1,269
Total	86	284	323	390	540	825	1,301	1,613	1,893	2,638

Source: Ministry of Transportation

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TABLE 2
Page 1

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Transport Infrastructure, Rolling Stock and Equipment

	1962	1965	1967	1969	1970	1971	1972	1973
ROADS								
1. Road Network								
National Highways (km)								
Paved	857	1,042	1,442	1,957	2,461	2,943	3,319	3,868
Gravel	4,819	4,949	6,651	6,407	6,158	5,818	5,585	5,400
Unrepaired	66	8	93	205	40	26	25	19
Sub-total	5,743	5,999	8,186	8,570	8,659	8,787	8,929	9,287
Local Roads (km)								
Paved	418	567	649	1,011	1,403	2,846	3,450	3,952
Gravel	17,671	17,874	21,863	23,953	26,803	25,333	27,110	26,848
Unrepaired	3,317	3,787	4,104	3,629	3,380	3,669	3,378	3,495
Sub-total	21,426	22,146	26,614	28,596	31,586	31,848	33,938	34,294
Total (km)								
Paved	1,275	1,627	2,092	2,970	3,864	5,789	6,769	7,820
Gravel	22,510	22,723	28,511	30,362	32,961	31,151	32,696	32,247
Unrepaired	3,383	3,794	4,170	3,836	3,420	3,695	3,403	3,514
Grand Total	27,169	28,145	34,800	27,168	40,245	40,635	42,868	43,581
km/km^2 (km)	0.28	0.29	0.35	0.38	0.38	0.41	0.46	0.47

Source: Ministry of Construction

2. Motor Vehicle Fleet								
Passenger Cars	11,074	13,001	23,235	50,299	60,677	67,582	70,244	78,334
Buses	4,406	9,313	11,499	14,327	15,831	19,411	17,500	18,871
Trucks	13,093	16,015	22,955	40,134	48,901	53,405	55,116	64,584
Others 1/	2,241	3,179	3,011	3,999	3,962	5,939	7,125	8,925
Total	30,841	41,508	60,700	108,759	129,371	144,337	150,035	170,714
persons/vehicle	1,038	771	527	294	247	225	217	193

1/ Includes motor cycles.

Source: Ministry of Transportation

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		1962	1965	1967	1969	1970	1971	1972
VESSELS (Gross Tonnage)								
Ocean-going:	Passenger		915	915	915	915	-	-
	Cargo		156,844	258,337	463,440	491,143	508,000	534,689
	Oil Tanker		5,242	152,721	275,455	248,887	328,000	331,238
Sub-total			163,001	411,973	739,810	740,954	836,000	865,927
Coastal:	Passenger		14,886	15,168	17,227	17,742	18,000	18,355
	Cargo		42,498	66,859	85,358	96,073	97,000	93,268
	Oil Tanker		8,616	34,751	63,148	65,173	96,000	97,387
Sub-total			66,000	116,778	165,732	178,988	211,000	209,000
Others:			156,485	209,924	290,638	298,948	346,000	389,430
TOTAL		373,099	385,486	738,675	1,196,180	1,218,811	1,294,000	1,464,357

Source: Ministry of Transportation

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TABLE 3

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Inventory of Motive Power and Rolling Stock (Actual Units)

Units as of December 31, 1973			Steam Locomotives	Diesel Locomotives Mainline	Diesel Locomotives Shunting	Electric Locomotives	Diesel Railcars	Passenger Cars	Freight Cars	Heating Cars
Total in Fleet			60 2/	301	35	37 3/	133	1,577	16,269 4/	141
In Service 1/		Sub-Total	43	268	31	31	79	1,372	14,154	113
		Percentage	72	89	89	83	59	87	87	80
Out of Service		Under Repair	6	9	1	4	27	170	1,115	14
		Awaiting Repair	11	24	3	2	27	35	1,000	14
		Sub-Total	17	33	4	6	54	205	2,115	28
		Percentage	28	11	11	17	41	13	13	20
Condition		Good	-	56	22	37	10	1,207	13,117	113
		Fair	37	111	-	-	70	26	1,760	10
		Poor	23	134	13	-	53	344	1,392	18
Age	Steam	Less than 20 Years	17							
		Between 21 and 40 Years	43							
		Over 41 Years	-							
	Diesel	Less than 10 Years		191	22		82			
		Between 11 and 20 Years		110	13		51			
		Between 21 and 30 Years		-	-		-			
		Over 31 Years		-	-		-			
	Electric	Less than 10 Years				37				
		Over 11 Years				-				
	Rolling Stock	Less than 10 Years						724	9,002	107
		Between 11 and 20 Years						543	2,505	6
		Between 21 and 30 Years						13	2,071	-
		Between 31 and 40 Years						205	2,663	10
		Over 41 Years						92	28	18
Carrying Capacity of Freight Cars		Up to 30 Tons							3,146	
		40 Tons							6,803	
		50 Tons							6,292	
		70 Tons							28	

1/ Total in fleet less under or awaiting repair on the average.
2/ Excluding 33 steam locomotives stored in either workshops or running sheds.
3/ In addition, KNR had 20 (under test runs) electric locomotives as of end-1973. Another 9 electric locomotives were delivered in 1974. Furthermore, 126 electric railcars were delivered in 1974.
4/ Including privately-owned freight cars.

Source: KNR and mission estimates.

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KNR Freight Traffic: 1964 - 1973 Actual

	1964			1965			1966			1967			1968			1969			1970			1971			1972			1973		
	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD
Grain	1.2	289	240	1.1	295	268	1.2	318	265	1.3	338	260	1.6	406	254	1.4	384	280	1.3	402	309	1.4	403	289	1.7	402	236	1.6	381	238
Fertilizer	1.0	217	217	1.8	316	176	1.7	186	109	1.2	202	168	1.5	312	208	1.2	330	277	1.1	312	284	1.1	344	303	1.3	347	267	1.5	420	280
Cement	1.1	323	294	1.5	412	275	1.7	476	280	2.2	565	257	3.1	844	272	4.4	911	209	4.9	1,003	205	5.8	1,222	211	6.0	1,125	188	7.5	1,344	179
Coal	8.3	1,768	215	8.9	1,848	208	10.0	2,070	207	11.0	2,242	204	9.6	2,103	218	10.3	2,377	230	12.1	2,785	230	12.4	2,881	238	11.3	2,620	232	13.6	3,201	235
Oil	0.4	143	358	0.6	184	307	0.7	238	337	1.1	350	328	1.5	515	343	1.8	559	303	2.4	641	267	2.5	724	293	2.2	574	261	2.7	645	239
Ore	0.6	231	385	1.0	262	262	1.0	269	269	1.4	335	239	1.7	368	217	1.7	402	234	1.8	453	252	1.6	424	265	2.5	347	231	2.3	568	247
Others	4.2	936	223	3.9	1,110	285	3.8	1,198	315	5.6	1,464	261	5.8	1,576	272	5.6	1,601	285	4.9	1,526	311	4.6	1,292	281	4.5	1,174	261	5.7	1,487	261
1. Sub-Total Commercial	16.8	3,907	233	18.8	4,427	235	20.1	4,755	237	23.8	5,496	231	24.8	6,124	270	26.4	6,564	249	28.5	7,122	252	29.1	7,290	251	28.5	6,589	231	35.0	8,045	230
2. Military Freight	2.1	389	185	2.1	387	184	2.1	403	192	2.3	464	202	2.8	548	203	2.7	552	204	2.1	439	209	1.9	449	234	2.4	575	240	1.7	433	255
3. KNR Freight	1.4	226	161	1.4	229	164	1.7	292	172	1.3	218	160	1.3	193	148	1.5	212	142	1.0	148	148	0.9	102	114	0.7	77	110	1.0	114	114
TOTAL	20.3	4,522	223	22.3	5,043	226	23.9	5,450	228	27.4	6,178	225	28.9	6,865	238	30.6	7,328	239	31.6	7,709	244	31.9	7,841	245	31.6	7,241	229	37.8	8,591	227

Note: T = million ton
TK = million ton-km
AD = average distance in km.

Source: KNR

March 1975

TABLE 4

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

KNR Freight Traffic: 1974 - 1979 Forecast

	1974			1975			1976			1977			1978			1979		
	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD	T	TK	AD
Grain	1.6	415	253	1.7	430	253	1.7	400	231	1.8	411	231	1.8	416	231	1.8	423	231
Fertilizer	1.8	509	286	1.9	544	286	2.2	624	280	2.5	711	280	2.6	733	280	2.6	739	280
Cement	8.3	1,501	180	8.9	1,604	180	9.5	1,717	180	11.7	2,097	180	13.9	2,504	180	15.4	2,777	180
Coal	14.7	3,375	229	16.6	3,802	229	17.6	4,105	233	18.6	4,391	236	19.9	4,754	239	21.1	5,055	240
Oil	3.5	844	240	3.1	745	240	4.7	1,102	233	5.2	1,209	233	5.9	1,363	233	3.7	971	233
Ore	2.2	573	256	2.8	716	256	3.1	820	261	3.4	895	261	3.7	971	261	4.1	1,073	261
Others	5.9	1,334	226	6.0	1,683	281	6.4	1,646	256	6.9	1,767	256	7.5	1,930	256	8.3	2,132	256
1. Sub-Total:Commercial	38.2	8,551	224	41.0	9,524	232	45.4	10,414	229	50.1	11,481	229	55.3	12,671	229	60.1	13,751	229
2. Military Freight	1.5	400	267	1.5	400	267	1.5	360	240	1.5	360	240	1.5	360	240	1.5	360	240
3. KNR Freight	0.9	123	137	0.9	123	137	1.0	99	99	1.0	99	99	1.0	99	99	1.0	99	99
TOTAL	40.6	9,074	224	43.4	10,047	232	47.9	10,873	227	52.6	11,940	227	57.8	13,130	227	62.6	14,210	227

Note: T = million ton
TK = million ton-km
AD = average distance in km

Source: KNR

March 1975

TABLE 5

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

KNR Passenger Traffic: 1964-1973 Actual

	NUMBER OF PASSENGERS (millions)				PASSENGER-KM (millions)				AVERAGE DISTANCE (km)			
Actual	Commuter	Long Dist.	Military	Total	Commuter	Long Dist.	Military	Total	Commuter	Long Dist.	Military	Total
1964	32.9	83.6	2.1	118.6	731	6,107	515	7,353	22.2	73.0	250.8	62.0
1965	32.2	73.1	1.9	107.2	725	5,672	520	6,917	22.5	77.6	269.0	64.5
1966	38.4	98.0	1.9	138.3	830	7,288	546	8,664	21.6	74.4	285.0	62.7
1967	41.6	108.4	1.9	151.9	883	8,150	543	9,576	21.2	75.2	288.9	63.6
1968	38.7	110.6	1.6	150.9	828	9,280	482	10,590	21.3	83.9	301.2	70.1
1969	37.9	114.8	2.0	154.7	799	9,680	598	11,077	20.0	84.0	304.0	71.0
1970	38.2	91.4	1.7	131.3	854	8,425	539	9,818	22.4	92.2	299.4	74.8
1971	41.4	85.2	1.6	128.2	940	7,300	510	8,750	22.7	85.7	320.0	68.3
1972	26.3	109.2	1.6	137.2	629	8,914	519	10,062	23.9	81.6	324.4	73.3
1973	22.5	118.9	1.6	143.0	552	9,681	487	10,720	24.5	81.4	304.4	75.0

Source: KNR

March 1975

TABLE 6

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

KNR Passenger Traffic: 1974 - 1979 Forecast

		1974			1975			1976			1977			1978			1979		
		P	PK	AD	P	PK	AD	P	PK	AD	P	PK	AD	P	PK	AD	P	PK	AD
SMESRS	Commuter	7.3	102	14	72.1	1,153	16	94.1	1,505	16	101.6	1,626	16	110.0	1,760	16	118.5	1,896	16
	Non-Commuter	4.7	91	19	48.1	769	16	65.7	1,004	15	71.0	1,136	16	76.6	1,226	16	82.8	1,325	16
Sub-Total		12.0	193	16	120.2	1,922	16	159.8	2,509	16	172.6	2,762	16	186.6	2,986	16	201.3	3,221	16
Others	Commuter	20.5	502	24	16.3	391	24	18.0	432	24	20.0	480	24	22.0	528	24	24.0	576	24
	Non-Commuter	60.0	1,368	23	57.5	1,323	23	63.3	1,456	23	68.3	1,912	28	73.8	2,214	30	79.7	2,391	30
	Non-Commuter	55.8	8,928	160	60.3	9,648	160	65.1	10,416	160	68.4	10,944	160	71.8	11,488	160	75.4	12,064	160
Sub-Total		136.3	10,798	79	134.1	11,362	85	146.4	12,304	84	156.7	13,336	85	167.6	14,230	85	179.1	15,031	84
Military		1.5	450	300	1.5	450	300	1.5	450	300	1.5	450	300	1.5	450	300	1.5	450	300
GRAND TOTAL		149.8	11,441	76	255.8	13,734	54	307.7	15,263	50	330.8	16,548	50	355.7	17,666	50	381.9	18,702	49

Note: P = million passengers
PK = million passenger-km
AD = average distance travelled per passenger in km

Source: KNR and mission estimates.

March 1975

TABLE 7

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

SUMMARY OF OPERATING STATISTICS (ALL TRAFFIC)

	1969	1970	1971	1972	1973
I. SYSTEM					
Route-km-Standard gauge (km)	3,073	3,073	3,086	3,086	3,086
-Narrow gauge (km)	125	125	125	47	47
-Total (km)	3,198	3,198	3,211	3,133	3,133
II. TRAFFIC					
Pass-km (millions)	11,077	9,819	8,750	10,062	10,720
Net ton-km (millions)	7,328	7,709	7,841	7,241	8,591
Traffic units (millions) 1/	18,405	17,528	16,591	17,303	19,311
III. OPERATION					
Train-km by mode of traction					
-Steam (000's)	655	1,334	706	258	240
-Diesel (000's)	31,258	33,271	35,423	38,808	39,665
-Diesel railcar (000's)	7,921	5,770	5,833	5,463	3,967
-Electric (000's)	-	-	-	-	2,145
-Total (000's)	39,834	40,375	41,962	44,528	46,017
Train-km by service					
-Passenger (000's)	23,426	23,183	24,084	27,602	27,794
-Freight (000's)	16,408	17,192	17,878	16,926	18,223
-Total (000's)	39,834	40,375	41,962	44,528	46,017
Locomotive-km					
-Steam (000's)	3,744	4,659	4,516	3,180	3,295
-Diesel (000's)	38,878	40,698	43,122	46,397	46,684
-Diesel railcar (000's)	14,587	11,900	12,286	12,281	9,376
-Electric (000's)	-	-	-	-	2,336
-Total (000's)	57,209	57,257	59,924	61,858	61,691
Number of locomotives in fleet					
-Steam	115	109	80	80	60 2/
-Diesel	282	277	337	336	336
-Diesel railcar	161	156	156	156	133
-Electric	-	-	-	-	37 3/
-Total	558	542	573	572	566
Availability of Locomotives					
-Steam (%)	n.a.	66	70	70	72
-Diesel (%)	86	86	88	89	89
-Diesel railcar (%)	65	67	67	68	59
-Electric (%)	-	-	-	-	83 4/

1/ Traffic unit=pass-km plus net ton-km.
2/ Excluding 33 steam locomotives stored
3/ Excluding 20 electric locomotives under test runs
4/ In December 1973

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

SUMMARY OF OPERATING STATISTICS (ALL TRAFFIC)

III. OPERATION (cont'd)	1969	1970	1971	1972	1973
Number of locomotives available					
-Steam	n.a.	72	56	56	43
-Diesel	243	238	297	299	299
-Diesel railcar	105	105	105	106	79
-Electric	-	-	-	-	31 1/
Loco.-km per loco.-day available					
-Steam	n.a.	177	221	156	210
-Diesel	438	468	429	425	428
-Diesel railcar	381	311	311	312	325
-Electric	-	-	-	-	388
Traffic units per locomotive in fleet (millions)	33.0	32.3	31.3	30.3	34.1
Number of passenger cars in fleet	1,662	1,681	1,631	1,597	1,577
Availability of passenger cars (%)	82	85	84	87	87
Number of passenger cars available	1,355	1,433	1,375	1,389	1,372
Passenger-vehicle 2/-km (millions)	179.5	183.1	178.4	204.2	207.7
Passenger-vehicle-km per vehicle-day available (km)	337	326	330	374	392
Pass-km per train km	473	423	363	365	386
Pass-km per passenger-vehicle available (millions)	7.6	6.4	5.9	6.7	7.4
Pass-km per passenger-vehicle-km	62	54	49	49	52
Number of freight cars in fleet	13,994	14,407	15,189	16,808	16,269
Availability of freight cars (%)	88	88	89	88	87
Number of freight cars available	12,315	12,678	13,518	14,791	14,154
Freight-car-km (millions)	328.3	325.9	332.4	322.9	372.3
Freight-car-km per car-day available (km)	73	70	67	60	72
Net Ton-km per train-km	447	448	439	428	471
Net Ton-km per freight car available (000's)	595	608	580	490	607

1/ In December 1973
2/ Comprising diesel railcars, passenger cars attached to diesel railcars and locomotive-hauled passenger cars.

KOREA

APPRAISAL OF A FIFTH RAILWAY PROEJCT

SUMMARY OF OPERATING STATISTICS (ALL TRAFFIC)

	1969	1970	1971	1972	1973
III. OPERATION (cont'd)					
Number of freight cars loaded (000's)	865	846	847	782	883
Average turn-around 1/ of freight cars (days)	5.2	5.5	5.8	6.9	5.8
Average load of freight cars loaded (tons)	35.4	37.4	37.8	40.4	42.8
IV. STAFF					
Number of employees					
-Government employee 2/	35,192	36,067	36,067	35,914	33,748
-Semi-Government employee	4,349	5,180	5,141	5,125	4,528
-Temporary	4,767	2,585	2,430	3,305	2,926
-Total	44,308	43,832	43,638	44,344	41,202
Traffic Units per employee (000's)	415	400	380	390	469

1/ Number of freight cars available divided by number of freight cars loaded daily.

2/ For workshop, hospital and dining room

Source: KNR and mission estimates

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Korean National Railroad

The Investment Plan 1975-1976 1/

US$1 = Won 485
UNIT: US$ in thousands, Won(W) in millions

		Total Expenditure for 1975-1976			1975			1976		
		Local W	Foreign US$	Total W	Local W	Foreign US$	Total W	Local W	Foreign US$	Total W
PART A.	Carryover of Investments Financed under the Third Railway Loan (Credit 183/Loan 669-KO)									
	(a) Seoul-Busan Microwave System	1,002	2,377	2,155	1,002	2,377	2,155	-	-	-
	(b) Consultants' Service									
	(i) Accounting Modernization	-	300	146	-	300	146	-	-	-
	(ii) Microwave System	-	-	-	-	-	-	-	-	-
	Sub-Total, Item A(b)	-	300	146	-	300	146	-	-	-
	(c) KNR Staff Training	-	90	43	-	90	43	-	-	-
	Sub-total Part A(a through c)	1,002	2,767	2,344	1,002	2,767	2,344	-	-	-
PART B.	Carryover of Investments Financed Under the Fourth Railway Loan (Loan 863-KO)									
	(a) Rail Renewal (130.9km)	441	-	441	441	-	441	-	-	-
	(b) Track Maintenance Equipment	2	400	196	2	400	196	-	-	-
	(c) Bridge Strengthening (2,446 tons)	484	1,788	1,351	484	1,788	1,351	-	-	-
	(d) Passenger Cars									
	(i) Ordinary Passenger Cars (78)	70	5 708	2,836	70	5,703	2,836	-	-	-
	(ii) Special Passenger Cars (19)	8	5,771	2,807	8	5,771	2,807	-	-	-
	Sub-total Part B(d)	78	11,474	5,643	78	11,474	5,643	-	-	-
	(e) Improvement to Existing Running Sheds	88	1,000	573	88	1,000	573	-	-	-
	(f) Improvement to Existing Workshops	194	1,760	1,048	194	1,760	1,048	-	-	-
	(g) Freight Car Workshops at Je Cheon and Ka Ya (Busan)	507	1,230	1,104	507	1,230	1,104	-	-	-
	Sub-total, Part B(a through g)	1,794	17,652	10,356	1,794	17,652	10,356	-	-	-
PART C.	Investments Other Than A and B									
	1. New Line Construction	597	-	597	597	-	597	-	-	-
	2. Electrification									
	(a) Industrial Lines Electrification (70.5km)	920	6,288	3,970	920	6,288	3,970	-	-	-
	(b) Seoul Suburban Electrification	825	2,908	2,235	825	2,908	2,235	-	-	-
	Sub-total Part C-2(a & b)	1,745	9,196	6,205	1,745	9,196	6,205	-	-	-

1/ In this table, bridge girders, passenger cars, freight cars, except 500 gondola cars procured in 1974, spare parts for passenger cars and freight cars and plant and machinery for motive power and rolling stock repair facilities have been taken as fully imported.

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Korean National Railroad

The Investment Plan 1975-1976 (continued)

US$ 1 = Won 485
UNIT: US$ in thousands, Won (W) in millions

	Total Expenditure for 1975-1976			1975			1976		
	Local W	Foreign US$	Total W	Local W	Foreign US$	Total W	Local W	Foreign US$	Total W
3. Increase in Station and Line Capacity									
(a) Signalling	5,550	7,642	9,256	2,156	7,642	5,862	3,394	-	3,394
(b) Double Tracking (27.3km)	4,431	-	4,431	1,517	-	1,517	2,914	-	2,914
(c) Marshalling Yard (3 yards)	2,795	1,296	3,424	411	-	411	2,384	1,296	3,013
(d) Station Yard Extension (7 stations)	2,149	-	2,149	843	-	843	1,306	-	1,306
(e) Station Building (3 Major Stations and Others)	1,274	-	1,274	764	-	764	510	-	510
(f) Short Cut Line (2 junctions)	433	116	489	212	-	212	221	116	277
(g) Installation of Crossing Loop (15 stations)	1,706	262	1,833	1,025	-	1,025	681	262	808
(h) Lengthening of Crossing Loop (10 stations)	808	-	808	401	-	401	407	-	407
Sub-total, Part C-3 (a through h)	19,146	9,316	23,664	7,329	7,642	11,035	11,817	1,674	12,629
4. Way and Structure Renewals and Improvement									
(a) Rail Renewal (155.5 km)	444	5,132	2,933	-	-	-	444	5,132	2,933
(b) Complete Track Renewal (80 km)	2,644	2,640	3,924	-	-	-	2,644	2,640	3,924
(c) Point and Crossing Improvement (390 sets)	612	690	947	-	247	120	612	443	827
(d) Concrete Sleeper (152,000)	1,986	-	1,986	786	-	786	1,200	-	1,200
(e) Ballast (500,000 cu.m)	1,320	-	1,320	577	-	577	743	-	743
(f) Track Maintenance Equipment	271	1,650	1,071	68	1,100	601	203	550	470
(g) Bridge Strengthening (5,900 tons)	1,180	4,543	3,384	560	2,156	1,606	620	2,387	1,778
(h) Miscellaneous Works	806	-	806	546	-	546	260	-	260
Sub-total, Part C-4 (a through h)	9,263	14,655	16,371	2,537	3,503	4,236	6,726	11,152	12,135
5. Motive Power and Rolling Stock									
(a) Diesel Locomotives (50) spare parts and repowering	291	50,372	24,719	120	25,136	12,311	171	25,236	12,408
(b) Electric Locomotives (10) and spare parts 1/	254	11,629	5,894	235	1,212	823	19	10,417	5,071
(c) Ordinary Passenger Cars (150) and wheel sets (200)	114	18,440	9,057	85	6,264	3,123	29	12,176	5,934
(d) Freight Cars (2,000) and wheel sets (2,000) 2/	4,115	36,140	21,643	3,081	11,244	8,534	1,034	24,896	13,109
(e) Heating Cars (25) and (other) equipment	597	1,379	1,265	374	617	673	223	762	592
(f) Rail cars (miscellaneous equipment)	2,002	1,100	2,536	1,626	1,100	2,160	376	-	376
Sub-total, Part C-5 (a through f)	7,373	119,060	65,114	5,521	45,573	27,624	1,852	73,487	37,490

1/ KNR have placed an order for 24 Electric Locomotives, 10 will be delivered by 1976, 7 more were justified and justification for balance of 7 will be submitted by KNR.

2/ 500 cars were acquired in 1974 and financed by Government, out of the balance of 1500 cars, 1000 cars will be acquired initially and the balance in consultation with the Bank after a review to be made by early 1976.

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Korean National Railroad

The Investment Plan 1975-1976 (continued)

US$ 1 = Won 485
UNIT: US$ in thousands, Won (W) in millions

ITEM	Total Expenditure for 1975-1976			1975			1976		
	Local W	Foreign US$	Total W	Local W	Foreign US$	Total W	Local W	Foreign US$	Total W
6. Motive Power and Rolling Stock Repair Facilities									
(a) Improvement to Existing Running Sheds	55	550	322	-	550	267	55	-	55
(b) Freight Car Workshop at Hae Dok	561	2,035	1,548	-	-	-	561	2,035	1,548
Sub-total, C-6 (a and b)	616	2,585	1,870	-	550	267	616	2,035	1,603
7. Miscellaneous									
(a) Telecommunications	843	-	843	-	-	-	843	-	843
(b) Electric Power	276	-	276	15	-	15	261	-	261
(c) Technical Adviser	-	200	98	-	100	49	-	100	49
(d) KNR Staff Traning	-	100	48	-	50	24	-	50	24
(e) Miscellaneous including procurement of ticket printing machines, housing and other works	1,549	440	1,762	580	-	580	969	440	1,182
Sub-total, Part C-7 (a through e)	2,668	740	3,028	595	150	668	2,073	590	2,360
Sub-total, Part C (1 through 7)	41,408	155,552	116,849	18,324	66,614	50,632	23,084	88,938	66,217
Total of Parts A, B and C	44,204	175,971	129,549	21,120	87,033	63,332	23,084	88,938	66,217
Contingencies									
(a) Physical (10%) 1/	3,961	5,739	6,744	1,776	3,805	3,621	2,185	1,934	3,123
(b) Price 2/	6,298	26,896	19,342	966	10,444	6,031	5,332	16,452	13,311
Sub-Total, (a and b)	10,259	32,635	26,086	2,742	14,249	9,652	7,517	18,386	16,434
GRAND TOTAL	54,463	208,606	155,635	23,862	101,282	72,984	30,601	107,324	82,651

1/ Only applicable to Part C. However, costs for 50 diesel locomotives, 10 electric locomotives, 150 ordinary passenger cars, all wheel sets and 2,000 freight cars have been excluded.

2/ For Civil Works, 16% increase for 1975 and 14% for 1976 has been applied for local costs except for items for which firm contracts have already been awarded (valued at Won 15 billion) in 1975. 12% increase for 1975 and 10% increase for 1976 has been applied to: (i) local and foreign costs for equipment and (ii) foreign exchange for civil works.

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

The Project 1975-1976 1/

US$1 = Won 485
UNIT = US$ in thousands, Won (W) in millions

ITEM	Total Expenditure for 1975-1976 Local W	Foreign US$	Total W	1975 Local W	Foreign US$	Total W	1976 Local W	Foreign US$	Total W
1. New Line Construction									
(a) Industrial Sidings (3.0 km) (Suncheon Area)	397	-	397	397	-	397	-	-	-
(b) Coal Sidings (5 km) (Go Han Area)	200	-	200	200	-	200	-	-	-
Sub-Total, Items I(a & b)	597	-	597	597	-	597	-	-	-
2. Electrification									
(a) Industrial Lines Electrification									
(i) Yeong Pong Line (about 71 km)	920	6,288	3,970	920	6,288	3,970	-	-	-
(b) Seoul Suburban Electrification	825	2,908	2,235	825	2,908	2,235	-	-	-
Sub-Total, Items 2 (a & b)	1,745	9,196	6,205	1,745	9,196	6,205	-	-	-
3. Increase in Station and Line Capacity									
(a) Signalling									
(i) Seoul CTC System (24 stations, 97.9 km)	1,300	7,642	5,006	1,300	7,642	5,006	-	-	-
(ii) Automatic Block Signalling (Dae Jeon - Busan about 180 km)	3,213	-	3,213	353	-	353	2,860	-	2,860
(iii) Automatic Train Stopping System	487	-	487	155	-	155	332	-	332
(iv) Station Signalling improvements (15 stations)	30	-	30	10	-	10	20	-	20
(v) Level crossing (25 stations)	520	-	520	338	-	338	182	-	182
Sub-Total, Item 3(a)	5,550	7,642	9,256	2,156	7,642	5,862	3,394		3,394
(b) Double Tracking									
(i) Ho Nam Line (about 21 km)	2,385	-	2,385	885	-	885	1,500	-	1,500
(ii) Tae Baeg Line (about 6.3 km)	2,046	-	2,046	632	-	632	1,414	-	1,414
Sub-Total, Item 3 (b)	4,431	-	4,431	1,517	-	1,517	2,914	-	2,914
(c) Marshalling Yard									
(i) Hae Dok (about 200 cars)	397	773	771	-	-	-	397	773	771
(ii) Je Cheon (about 580 cars)	898	523	1,153	411	-	411	487	523	742
(iii) Bu Gok (about 500 cars)	1,500	-	1,500	-	-	-	1,500	-	1,500
Sub-Total, Item 3(c)	2,795	1,296	3,424	411	-	411	2,384	1,296	3,013
(d) Station Yard Extension (7 stations)	2,149	-	2,149	843	-	843	1,306	-	1,306
(e) Station Buildings (3 major stations and others)	1,274	-	1,274	764	-	764	510	-	510
(f) Bypass Lines (2 junctions)	433	116	489	212	-	212	221	116	277
(g) Installation of Crossing Loops (about 15 stations)	1,706	262	1,833	1,025	-	1,025	681	262	808
(h) Lengthening of Crossing Loops (about 10 stations)	808	-	808	401	-	401	407	-	407
Sub-Total, Items 3(a through h)	19,146	9,316	23,664	7,329	7,642	11,035	11,817	1,674	12,629

1/ In this table, bridge girders, passenger cars, freight cars except 500 Gondola cars procured in 1974, spare parts for passenger cars and freight cars and plant and machinery for motive power and rolling stock repair facilities have been taken as fully imported.

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

The Project 1975-1976 1/

US$1 = Won 485
UNIT=US$ in thousands, Won(W) in millions

	Total Expenditures for 1975-1976			1975			1976		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
4. Way & Structure Renewals and Improvement	W	US$	W	W	US$	W	W	US$	W
(a) Rail Renewal (about 155.5 km)	444	5,132	2,933	-	-	-	444	5,132	2,933
(b) Complete Track Renewal (about 80 km)	2,644	2,640	3,924	-	-	-	2,644	2,640	3,924
(c) Points and Crossings Improvement (about 390 sets)	612	690	947	-	247	120	612	443	827
(d) Concrete Sleepers (about 152,000)	1,986	-	1,986	786	-	786	1,200	-	1,200
(e) Ballast (about 500,000 cu.m)	1,320	-	1,320	577	-	577	743	-	743
(f) Track Maintenance Equipment									
(i) Equipment	68	1,100	601	68	1,100	601	-	-	-
(ii) Spare Parts	203	550	470	-	-	-	203	550	470
Sub-Total, Item 4(f)	271	1,650	1,071	68	1,100	601	203	550	470
(g) Bridge Strengthening and renewals (5,900 tons)	1,180	4,543	3,384	560	2,156	1,606	620	2,387	1,778
(h) Miscellaneous	806	-	806	546	-	546	260	-	260
Sub-Total, Item 4 (a through h)	9,263	14,655	16,371	2,537	3,503	4,236	6,726	11,152	12,135
5. Motive Power & Rolling Stock									
(a) Diesel Locomotives									
(i) Diesel Locomotives (50)	153	25,000	12,275	120	20,000	9,820	33	5,000	2,455
(ii) Re-Powering (52 diesel locomotives)	120	17,100	8,414	-	1,000	485	120	16,100	7,929
(iii) Spare Parts for Maintenance Normalization	18	8,272	4,030	-	4,136	2,006	18	4,136	2,024
Sub-Total past 5(a)	291	50,372	24,719	120	25,136	12,311	171	25,236	12,408
(b) Electric Locomotives									
(i) Electric Locomotives (10)	19	10,417	5,071	-	-	-	19	10,417	5,071
(ii) Spare Parts	235	1,212	823	235	1,212	823	-	-	-
Sub-Total, Item 5(b)	254	11,629	5,894	235	1,212	823	19	10,417	5,071
(c) Passenger Cars									
(i) Ordinary passenger car (150 cars)	29	18,000	8,759	10	6,000	2,920	19	12,000	5,839
(ii) Wheel sets for Maintenance (200)	85	440	298	75	264	203	10	176	95
Sub-Total, Item 5(c)	114	18,440	9,057	85	6,264	3,123	29	12,176	5,934
(d) Freight Cars									
(i) Box cars (400)	44	10,400	5,088	22	5,200	2,544	22	5,200	2,544
(ii) Gondola (1,100)	98	22,000	10,768	45	3,800	1,888	53	18,700	8,880
(iii) Wheelsets for Maintenance Normalization (2000)	551	3,740	2,365	14	2,244	1,102	537	1,496	1,263
(iv) 500 cars acquired in 1974 (Financed by Govt.)	3,422	-	3,422	3,000	-	3,000	422	-	422
Sub-Total, Item 5(d)	4,115	36,140	21,643	3,081	11,244	8,534	1,034	24,896	13,109
(e) Heating Cars									
(i) Rebuilding (25 cars)	300	908	740	120	363	296	180	545	444
(ii) Replacement of Heating Equipment (13 cars)	297	471	525	254	254	377	43	217	148
Sub-Total, Item 5(e)	597	1,379	1,265	374	617	673	223	762	592
(f) Miscellaneous - including rebuilding 50 container cars and 200 cabooses and reengining of 20 rail cars	2,002	1,100	2,536	1,626	1,100	2,160	376	-	376
Sub-Total, Item 5 (a through f)	7,373	117,960	64,580	5,521	45,573	27,624	1,852	72,387	36,956
6. Motive Power & Rolling Stock Repair Facilities									
(a) Improvement to Existing Running Sheds	55	550	322	-	550	267	55	-	55
(b) Freight Car Workshop at Hae Dok	561	2,035	1,548	-	-	-	561	2,035	1,548
Sub-Total, Item 6 (a and b)	616	2,585	1,870	-	550	267	616	2,035	1,603

1/ In this table, bridge girders, passenger cars, freight cars except 500 gondola cars procured in 1974 spare parts for passenger cars and freight cars and plant and machinery for motive power and rolling stock repair facilities have been assumed as fully imported.

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

THE PROJECT 1975-1976 1/

		Total Expenditures for 1975-1976			1975			1976		
		Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
		W	US$	W	US$	W	US$	W	US$	W
7.	Miscellaneous									
	(a) Telecommunications	843	-	843	-	-	-	843	-	843
	(b) Electric Power	276	-	276	15	-	15	261	-	261
	(c) Technical Advisor	-	200	98	-	100	49	-	100	49
	(d) KNR Staff Training	-	100	49	-	50	24	-	50	25
	(e) Miscellaneous including replacing ticket printing machines	1,549	440	1,762	580	-	580	969	440	1,182
	Sub-Total, Item 7(a through e)	2,668	740	3,028	595	150	668	2,073	590	2,360
8.	Total, Items (1-7)	41,408	155,552	116,849	18,324	66,614	50,632	23,084	88,938	66,217
9.	Contingencies									
	(a) Physical 10% 2/	3,961	5,739	6,744	1,776	3,805	3,621	2,185	1,934	3,123
	(b) Price 3/	6,298	23,789	17,635	966	7,337	4,524	5,332	16,452	13,311
	Sub-Total, Item 9 (a and b)	10,259	29,528	24,579	2,742	11,142	8,145	7,517	18,386	16,434
11.	GRAND TOTAL	51,667	185,080	141,428	21,066	77,756	58,777	30,601	107,324	82,651

1/ In this table, bridge girders, passenger cars, freight cars except 500 gondola cars procurred in 1974, spare parts for passenger cars, freight cars and plant and machinery for motive power and rolling stock repair facilities have been assumed as fully imported.

2/ Costs of 50 diesel locomotives, 10 electric locomotives, 150 passenger cars, all wheel sets and 2000 freight cars have been excluded.

3/ For civil works, 16% increase for 1975 and 14% increase for 1976 has been applied for local costs except for items for which firm contracts have already been awarded in 1975 (valued at won 15 billion);12% increase for 1975 and 10% increase for 1976 has been applied to (i) local and foreign costs for equipment and (ii) foreign exchange for civil works.

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Items Financed under the Loan

	Item	Amount US$ Million
1.	Track Materials and equipment	
	- 50 kg/m rails (about 23,550 tons)	7.8
	- 37 kg/m rails (about 5,073 tons)	1.7
	- Materials for points and crossings	0.7
	- Track maintenance equipment	1.1
	- Spare parts for track maintenance equipment purchased under the third and fourth loans	0.5
	Sub-Total	11.8
2.	Fabricated bridge girders (about 5,900 tons)	4.5
3.	Spare parts for diesel locomotives	8.2
4.	Passenger cars	
	- 150 ordinary passenger cars	18.0
	- about 200 wheelsets	0.5
	Sub-Total	18.5
5.	Freight cars	
	- 400 box cars	10.4
	-1100 gondola cars	22.0
	- about 2,000 wheelsets	3.7
	Sub-Total	36.1
6.	Component for rebuilding heating cars and replacing heating equipment of heating cars	1.4
7.	Plant and machinery for workshops and running sheds	2.6
8.	Services of a technical adviser	0.2
9.	KNR staff training	0.1
10.	Contingencies	16.6
11.	GRAND TOTAL	100.0

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Estimated Schedule of Disbursement

IBRD Fiscal Year and Quarter	Cumulative Disbursement at end of Quarter
	US$ million
1975/76	
September 30, 1975	-
December 31, 1975	2.1
March 31, 1976	14.8
June 30, 1976	35.4
1976/77	
September 30, 1976	57.4
December 31, 1976	80.0
March 31, 1977	95.0
June 30, 1977	98.0
1977/78	
September 30, 1977	100.0

Principal Assumptions:

1. Effective date of Loan: Not later than July 15, 1975

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Income Statement

1969-1979

(Won Billions)

Fiscal Dec 31		Actual					Forecast					
	Operating Revenues	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	Passenger Revenue	18.1	19.4	17.3	20.7	22.8	29.9	39.3	44.9	47.5	51.9	55.0 2/
	Freight Revenues	11.1	11.1	11.6	13.3	15.7	20.1	26.6	28.8	31.6	34.7	37.7 2/
	Other Train Revenues	2.5	2.5	1.5	1.7	2.4	3.0	2.9	3.2	3.4	3.7	3.9
	Miscellaneous	-	-	0.8	0.6	0.7	0.8	1.2	1.2	1.5	1.7	1.9
	Total Operating Revenue	31.7	33.0	31.2	36.3	41.6	53.8	70.0	78.1	84.0	92.0	98.5
	Add: (%) Pass Fare Increase							2.9 10%	10.5 10%	15.7 10%	24.0 10%	25.5
	(%) Frt. Rate Increase							2.0 10%	7.6 15%	16.4 20%	23.2 10%	23.3 5%
	Sub Total							4.9	18.1	32.1	47.2	53.8
	Restated Operating Revenues	31.7	33.0	31.2	36.3	41.6	53.8	74.9	96.2	116.1	139.2	152.3
	Less: Operating Expenses											
	Labor			13.2	13.8	14.3	17.7	24.4	28.4	32.3	36.3	40.9
	Fuel			3.9	4.2	6.3	12.1	14.7	16.7	18.2	20.0	21.9
	Materials & Supplies			7.3	7.5	8.0	12.2	15.3	21.8	24.0	26.4	29.0
	All Other			3.4	4.1	5.4	6.3	8.9	10.7	11.2	12.4	13.8
	Total Cash Expenses	20.2	23.8	27.8	30.0	34.0	48.3	63.3	77.6	85.7	95.1	105.6
	Add: Depreciation	3.6	3.9	4.0	4.5	4.9	5.9	7.3	9.2	10.9	12.0	13.1
	Total Operating Expenses	23.8	27.7	31.8	34.5	38.9	54.1	70.6	86.8	96.6	107.1	118.7
	Net Operating Revenue (Loss)	7.9	5.3	(0.6)	1.8	2.7	(0.3)	4.3	9.4	19.5	32.1	33.6
	Less: Interest Charges	1.6	1.8	3.3	5.8	6.5	6.9	11.9	15.7	24.1	26.2	29.0
	Net Revenue - Railway Operations	6.3	3.5	(3.9)	(4.0)	(3.8)	(7.2)	(7.6)	(6.3)	(4.6)	5.9	4.6
	Other Revenue/Expense											
	Non-Operating Revenue			0.9	1.0	1.7	1.5	2.4	2.1	2.5	3.0	3.5
	Non-Operating Expense			(1.3)	(0.5)	(0.1) 3/	(0.6)	(1.0)	(3.0)	(0.7)	(0.8)	(0.8)
	Non-Recurring Expense			(0.3)	(0.4)	(4.9) 3/	0.8	1.3	1.3	(0.9)	(0.9)	(0.9)
	Other Revenue/Expense Net	(1.8)	(0.5)	(0.7)	0.1	(3.3)	1.7	2.7	0.4	0.9	1.3	1.8
	Net Revenue - (Deficit)	4.5	3.0	(4.6)	(3.9)	(7.1)	(5.5)	(4.9)	(5.9)	(3.7)	(7.2)	(6.4)
	Add: R.O.K. Subsidy 1/	-	-	-	-	1.5	7.9	3.8	-	-	-	-
	Net Income - Adjusted	4.5	3.0	(4.6)	(3.9)	(5.6)	2.4	(1.1)	(5.9)	(3.7)	7.2	6.4
	Add: Depreciation	3.6	3.9	4.0	4.5	4.9	5.9	7.3	9.2	10.9	12.0	13.1
	Total Cash Income	8.1	6.9	(0.6)	0.6	(0.7)	8.3	6.2	3.3	7.2	19.2	19.5
	Operating Ratio %	75	84	102	95	92	102	94	93	83	77	78
	Interest Charge Coverage			-	0.3	0.4	-	0.4	0.6	0.8	1.2	1.2
	Debt Service	3.4	1.7	-	0.5	0.5	0.5	0.7	0.8	0.9	1.2	1.3
	Return On Net Fixed Assets	4.4	2.9	-	0.9	1.1	-	1.1	2.1	3.8	5.9	5.8

1/ Partial compensation for revenues foregone due to not implementing general rate increases in 1973.

2/ 1975 - 1979 figures at 1974 tariffs.

3/ Largely a loss on foreign exchange fluctuations.

N.B. - ( ) Indicates Deficit.

Source: Actual, KNR Unaudited (1973 are audited figures)
Forecast, KNR Staff and mission.

March 1975

TABLE 12

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

BALANCE SHEETS

1969-1979

(Won Billions)

Fiscal Dec. 31	1969	1970	1971 Actual	1972	1973	1974	1975	1976	1977 Forecast	1978	1979
Current Assets											
Cash	0.5	0.2	0.5	0.4	1.4	1.0	1.6	1.9	2.0	2.4	3.0
Accounts Receivable	-	-	-	3.6	4.5	3.3	4.9	6.2	8.2	9.8	11.2
Total Quick Assets	0.5	0.2	0.5	4.0	5.9	4.3	6.5	8.1	10.2	12.2	14.2
Inventory	6.5	6.8	11.2	3.7	4.0	7.3	9.9	12.2	13.5	15.0	16.6
Total Current Assets	7.0	7.0	11.7	7.7	9.9	11.6	16.4	20.3	23.7	27.2	30.8
Current Liabilities											
Current portion of long-term debit	-	-	-	2.3	2.3	2.8	2.8	4.0	3.9	4.0	4.0
Accounts Payable	-	-	-	12.0	11.8	8.6	8.8	11.2	14.2	16.2	16.6
All Other	-	-	-	5.3	4.2	4.5	4.6	4.7	4.9	5.0	5.1
Total Current Liabilities	7.7	10.6	16.4	19.6	18.3	15.9	16.2	19.9	23.0	25.2	25.7
Net Working Capital	(0.7)	(3.6)	(4.7)	(11.9)	(8.4)	(4.3)	0.2	0.4	0.7	2.0	5.1
Fixed Assets											
Fixed Assets	-	-	173.1	197.4	207.1	257.7	328.4	409.0	460.4	504.5	555.2
Land	-	-	33.9	33.7	130.2	130.2	130.2	130.2	130.2	130.2	130.2
Gross Book Value	184.2	192.8	207.0	231.1	337.3	387.9	458.6	539.2	590.6	634.7	685.4
Less: Accumulated Depreciation	9.7	13.3	17.0	25.8	25.8	36.6	43.9	53.1	64.0	76.0	89.1
Net Book Value	174.5	179.5	190.0	205.3	311.5	351.3	414.7	486.1	526.6	558.7	596.3
Add: Construction in Progress	8.9	7.2	6.5	24.5	29.1	25.7	28.0	30.0	30.0	28.0	26.0
Total Net Fixed Assets	183.4	186.7	196.5	229.8	340.6	377.0	442.7	516.1	556.6	586.7	622.3
Deferred Assets 1/	4.4	5.0	32.5	-	-	22.0	22.0	22.0	22.0	22.0	22.0
Other Assets											
Assets Chgd. to Loan Acct/Not Recd.	0.4	0.1	-	-	-	)	)	)	)	)	)
Investments	1.1	1.9	2.2	4.4	6.4	3.0)	3.0)	3.0)	3.0)	3.0)	3.0)
Prepaid & Other	3.7	10.5	11.6	0.1	0.1	)	)	)	)	)	)
Total Other Assets	5.2	12.5	13.8	4.5	6.5	3.0	3.0	3.0	3.0	3.0	3.0
TOTAL ASSETS	192.3	200.6	238.1	222.4	338.7	397.7	467.9	541.5	582.3	613.7	652.4
Long Term Debt	32.1	35.0	75.3	80.5	100.5	162.3	203.0	245.5	267.0	280.0	299.5
Provision for Severance Pay	-	-	-	1.0	1.3	1.9	1.9	2.4	3.0	3.7	4.5
Government Contributions	-	-	-	-	-	-	31.2	67.7	90.1	100.6	112.6
Equity and/or Ownership 2/											
Revaluation of Assets	68.9	71.4	72.9	77.6	177.1	177.1	177.1	177.1	177.1	177.1	177.1
Fixed Capital (Cash or in kind)	73.2	73.2	73.2	69.7	69.9	69.9	69.9	69.9	69.9	69.9	69.9
Accumulated Surplus (Deficit)	18.1	21.0	16.7	(6.4)	(10.1)	(13.4)	(15.2)	(21.1)	(24.8)	(17.6)	(11.2)
Total Equity and/or Ownership	160.2	165.6	162.8	140.9	236.9	233.6	231.8	225.9	222.2	229.4	235.8
TOTAL EQUITY AND LIABILITIES	192.3	200.6	238.1	222.4	338.7	397.8	467.9	541.5	582.3	613.7	652.4

Note - 1/ Deferred loss on foreign exchange fluctuations.

2/ Every five years R.O.K. permits revaluation of land

3/ 1972 and 1973 figures adjusted according to audit reports

March 1975

TABLE 13

TABLE 14

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Long-term Debt as of December 31, 1973

		Date	Original Amount	Amount Out-standing	Interest Rate %	Repayment: Grace period	Repayment: Repayment period
USAID							
- first loan	($)	1962	6,388,391	3,513,620	5.75	1	20
- second loan	($)	1965	10,711,923	6,909,240	5.75	1	20
- third loan	($)	1966	18,509,995	10,972,650	5.75	1	15
IDA							
- Cr 25-KO	($)	1962	13,992,924	16,872,694	5.75	1	25
- Cr110-KO	($)	1967	10,645,205	12,841,782	6.00	3	22
- Cr183-KO	($)	1970	15,000,000	18,085,884	7.00	4	21
IBRD							
-Ln 669 KO	($)	1970	40,000,000	36,894,672	7.00	4	21
-Ln 863 KO	($)	1972	40,000,000	-	7.25	4	21
UK							
	(£)	1964	500,000	284,000	6.75 to 7.75	4	10
OECF (Japan)							
- first loan	(Y)	1966	4,879,388,398	2,915,168,758	5.75	1	19
- second loan	(Y)	1967	3,339,553,900	2,486,533,900	5.75	1	19
- third loan	(Y)	1972	15,420,000,000	5,064,780,394	5.00	5	15
KFW							
- first loan	(DM)	1970	8,870,000	323,000	5.75	7	18
- second loan	(DM)	1973	17,000,000	-	5.75	7	18
Equivalent totals at December 31, 1973 rate of exchange			W 103,031 million	W 55,775 million			

OTHER CREDIT GRANTORS

Details at December 31, 1973 were as follows:

		Date	Original Amount	Amount Out-standing	Interest Rate	Repayment: Grace period	Repayment: Repay. period
KDB							
- first loan	(W)	1966	1,871 million	1,492.8 million	6.00	5	15
- second loan	(W)	1967	1,700 "	1,476.8 "	6.00	5	15
- third loan	(W)	1971	5,500 "	5,500 "	6.00	5	15
- fourth loan	(W)	1972	5,200 "	5,200 "	6.00	5	15
- fifth loan	(W)	1973	6,210 "	6,210 "	6.00	5	15
The 50 C/S Grp.		1969			Price I		
	(FF)		107,695,150 "	78,532,785 "	6.00	2	13
	(DM)		69,475,426 "	50,741,019 "	Price II		
	(BF)		575,320,515 "	412,046,617 "	8.00	3	7
	(£)		3,171,940 "	2,220,243 "			
	(SF)		19,741,225 "	14,566,094 "			
Ex-Imp Bank of the U.S.	($)	1968	5,999,022 "	2,141,877 "	6.00	-	7
Suppliers	($)		22,228,672 "	10,989,646 "	5,25 to 6.20		
Equivalent totals at December 31,1973 rate of exchange			W 62,041 million	W 47,090 million			

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Growth in Key Financial Data

1969-1979

(Index - 1969 & 1970 equals 100)

	Income Statement					Balance Sheet		
Year	Total Revenues	Total Op. Exp.	Interest Charges	(1) Net Income	(2) Total Cash Inc.	Total Assets	L.T. Debt	Net Equity
1969	98	93	94	120	107	98	96	98
1970	102	108	106	80	93	102	104	102
1971	97	124	194	(123)	(8)	121	225	100
1972	112	134	341	(104)	8	113	239	86
1973	129	151	382	(189)	9	172(3)	300	145(3)
1974(e)	167	199	441	(141)	5	207	510	144
1975(f)	231	275	700	(131)	32	239	606	142
1976(f)	297	338	924	(157)	44	276	733	139
1977(f)	358	376	1418	(99)	95	296	797	136
1978(f)	430	417	1541	192	254	312	836	141
1979(f)	470	462	1706	171	258	331	894	145

N.B.(e) Estimated

(f) Forecast

( ) Indicates deficits

(1) Net income after all expenses but before subsidies

(2) Cash income (net income plus depreciation). Excludes subsidies of Won 1.5, 5.9 and 3.8 bil. for the years 1973 thru 1975.

(3) The Asset base and Net Equity were increased by 98.7 billion Won ($247 million U.S.) in 1973 due to a re-valuation of land assets.

Source: Tables 12 and 13

March 1975

TABLE 16

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

Ratio Review

1969-1979

	Fixed Charge Coverage	Debt Service	Rate of Return	Debt/Equity
1969	3.8 x	2.9 x	4.5 %	17/83
1970	2.7 x	2.0 x	3.0 %	18/82
1971	(Deficit)	0.5 x	-	32/68
1972	0.3 x	0.5 x	0.9 %	36/64
1973	0.5 x	0.6 x	1.3 %	30/70
1974 (f)	0.4 x	0.5 x	1.0 %	41/59
1975 (f)	0.4 x	0.7 x	1.1 %	47/53
1976 (f)	0.6 x	0.8 x	2.1 %	52/48
1977 (f)	0.8 x	0.9 x	3.8 %	55/45
1978 (f)	1.2 x	1.2 x	5.9 %	55/45
1979 (f)	1.2 x	1.2 x	5.8 %	56/44

N.B. (f) Forecast

March 1975

KOREA

APPRAISAL OF A FIFTH RAILWAY PROJECT

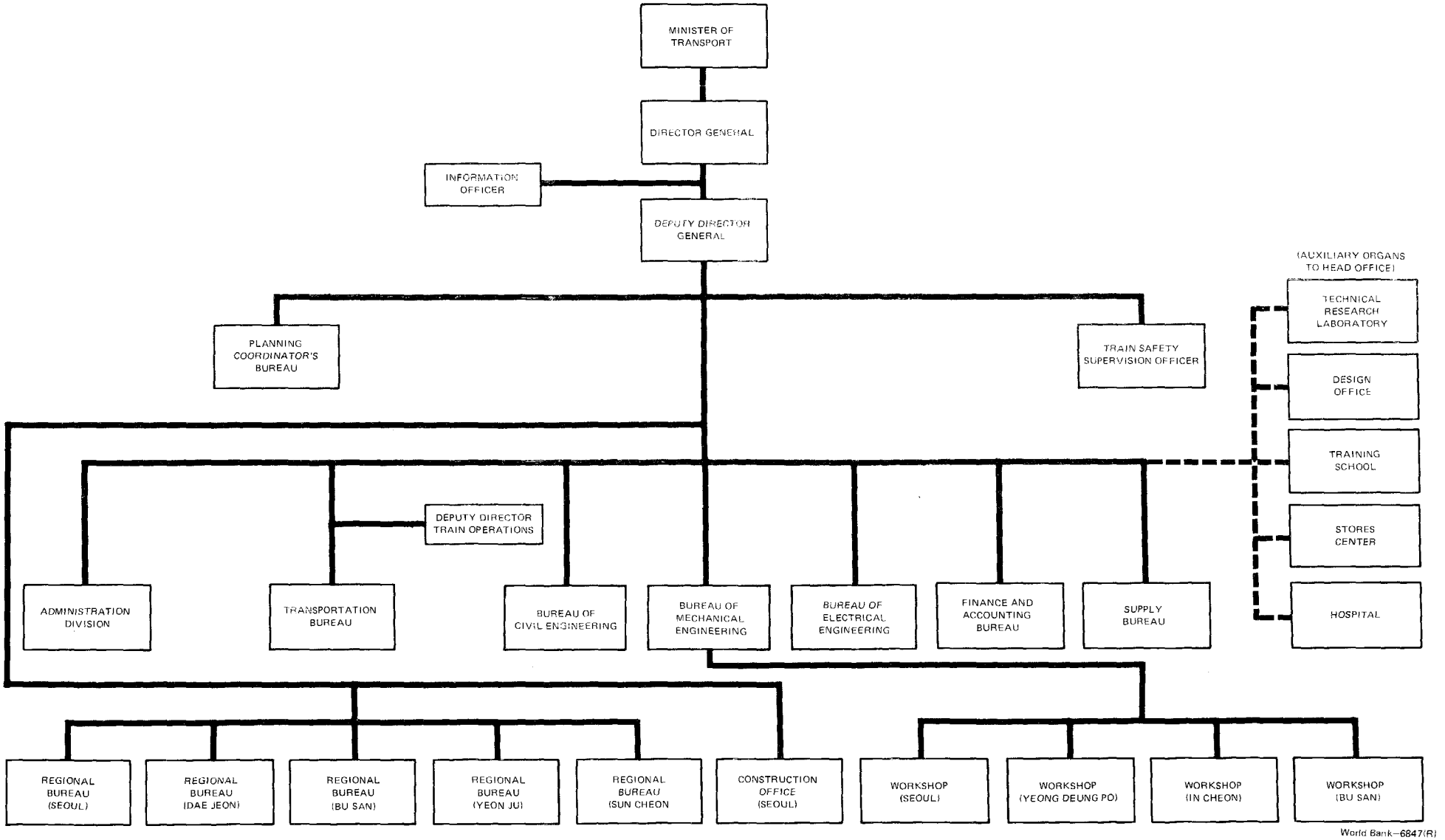
CASH FLOW STATEMENT 1969-1979
(Won Billions)

	Actual					Forecast					
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
SOURCES OF FUNDS											
Cash Generated By KNR											
Net Operating Revenue	7.9	5.3	(0.6)	1.8	2.7	(0.3)	4.3	9.4	19.5	32.1	33.6
Depreciation	3.5	3.9	4.0	4.5	4.9	5.9	7.3	9.2	10.9	12.0	13.1
Net Non Operating Revenue (Expense)	(1.8)	(0.5)	(0.7)	0.1	1.3	1.7	2.7	0.4	0.9	1.3	1.8
Total Cash Generated	9.6	8.7	2.7	6.4	8.9	7.3	14.3	19.0	31.3	45.4	48.5
Government Operating Subsidy					1.5	5.9	3.8	-	-	-	-
Increase in Severance Pay Provision						0.6	-	0.5	0.6	0.7	0.8
Funds Provided by Government	0.5	2.5	1.5	-	0.8	-	31.2	36.5	22.4	10.5	12.0
Borrowing:											
Proposed Bank Loan	-	-	-	-	-	-	15.0	33.5	-	-	-
Other	10.5	6.2	45.8	6.9	27.4	47.0	33.6	18.5	33.5	24.8	31.5
Total Borrowing	10.5	6.2	45.8	6.9	27.4	47.0	48.6	52.0	33.5	24.8	31.5
Decrease In Other Assets	-	-	-	22.9	-	-	-	-	-	-	-
Total Sources of Funds	20.6	17.4	50.0	36.2	38.6	60.8	97.9	108.0	87.8	81.4	92.8
APPLICATION OF FUNDS											
Capital Investment - Local Currency						15.5	23.9	30.6	17.9	17.3	17.2
" " - Foreign Exchange						26.8	49.1	52.0	33.5	24.8	31.5
Total Capital Investment	11.6	7.2	13.8	24.9	10.5	42.3	73.0	82.6	51.4	42.1	48.7
Debt Service - Interest Charges	1.6	1.8	3.3	5.8	6.5	6.9	11.9	15.7	24.1	26.2	29.0
- Repayment	1.2	3.3	5.5	10.7	8.0	7.9	8.5	8.3	12.1	11.7	12.0
Total Debt Service	2.8	5.1	8.8	16.5	14.5	14.8	20.4	24.0	36.2	37.9	41.0
Increase In Other Assets	0.3	7.9	28.8	-	10.3	-	-	-	-	-	-
Unexplained Charges to Earned Surplus	0.7	0.1	(0.3)	0.4	2.0	-	-	-	-	-	-
Net Change In Working Capital	5.2	(2.9)	(1.1)	(5.6)	1.3	3.7	4.5	1.4	0.2	1.4	3.1
Total Application of Funds	20.6	17.4	50.0	36.2	38.6	60.8	97.9	108.0	87.8	81.4	92.8

TABLE 17

March 1975

KOREA
KOREAN NATIONAL RAILROAD ORGANIZATION



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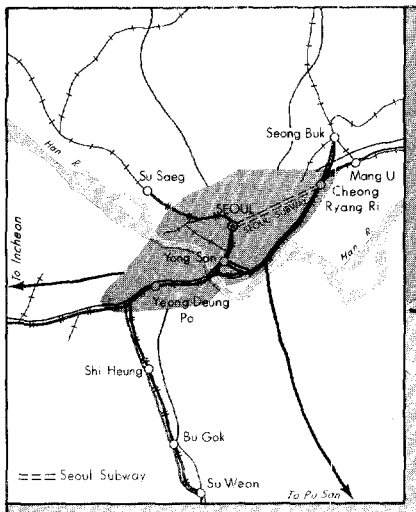
NOVEMBER 1974

REPUBLIC OF KOREA
KOREAN NATIONAL RAILROAD



The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.

Railroads
- Standard gauge, Double track
- Standard gauge, Single track
- Narrow gauge, Single track
- Electrified
- Under electrification

Roads
- Expressway, Four lane, Toll
- Primary roads, Paved
- Primary roads, Paved, Under construction
- International boundary

0 20 40 60 80 100
Kilometers

KOREA
NORTH
Sea of Japan
Yellow Sea
Korean Strait

Sin Tan Ri
Sok Cho
Mun San
Chun Cheon
Gangwha
Gyeong Po Dae
Gang Reung
Mug Ho
Bug Pyeong
Sam Cheog
Sam Wha
Yec Ryong
Jeong Seon
Go Han
Chung San
Ye Mi
Jo Dong
Hwang Ji
Baeg San
Cheol Am
Ham Baeg
Bong Yang
Je Cheon
San Gok
Do Dam
An Seong
Cheon An
Yeon Ju
Mun Gyeong
Bul Jeong
Gae Un
Jeom Chon
Andong
Yeongdeog
Jo Chi Weon
Gongju
Hae Dok
Sangju
Og Ma
Buyeo
Doe Jeon
Non San
Du Koe
Kae Tae Sa
Bi In
Seo Cheon
Jang Hang
Doe Ya
Ham Yeol
Gun San
In
Og Gu
Gim Jae
Jeon Ju
Gim Cheon
Po Hang
Yeong Cheon
Dae Gu
Gyeong Ju
Ul San
Ul San Hang
Jang Sang Po
Sam Rang Jin
Namweon
Geum Ji
Chang Weon
Jin Ju
Mu San
Jin Hae
Busan
Song Jeong Ri
Gwangju
Goe Yang
Boe Am
Hag Geo
Naju
Sam Cheon Po
Suncheon
Beolyo
Chungmu
Mog Po
Yeo Su
Gangjin
Gopheung
Jeju
CHINA
Seoul
REPUBLIC OF KOREA
JAPAN